
Chapter 10

Hydrogeology

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10. Hydrogeology

10.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) presents the hydrogeological assessment of the proposed Barnesmore Gap Greenway project (the 'proposed development' hereafter).

This chapter sets out the methodology used to undertake the assessment (Section 10.3), describes the existing environment (Section 10.4), examines the predicted impacts of the proposed development (Section 10.5), proposes mitigation and monitoring measures (Section 10.6 and Section 10.7, respectively), and identifies residual impacts (Section 10.7).

This chapter should be read in conjunction with the following chapters, and their appendices, which present related impacts arising from the proposed development:

- Chapter 04: Description of the proposed development.
- Chapter 07: Biodiversity.
- Chapter 08: Lands and Soils.
- Chapter 09: Hydrology.
- Chapter 20: Interactions and Cumulative Effects.
- Chapter 21: Summary of Mitigation and Monitoring Measures.

10.2 Legislation, Policy and Guidance

10.2.1 Legislation

The following European legislation and transposing Irish regulations are of relevance to the groundwater environment assessment and to the proposed development:

- European Union (EU) Water Framework Directive (WFD) (2000/60/EC), as amended in 2008 (by Directive 2008/105/EC) and in 2013 (by Directive 2013/39/EU).
- European Communities (EC) (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003), as amended in 2014 (by S.I. No. 350 of 2014), and in 2022 (by S.I. No. 166 of 2022) and in 2025 (by S.I. No. 52 of 2025).
- EU (Water Policy) (Abstractions Registration) Regulations, 2018 (S.I. No. 261 of 2018) and as amended in 2022 (by S.I. No. 166 of 2022).
- EC (Drinking Water) Regulations 2014 (S.I. 122 of 2014), as amended in 2022 (by S.I. No. 286 of 2022), and in 2023 (by S.I. No. 99 of 2023).
- EC Environmental Objectives (Surface Water) Regulations, 2009 ('S.I. No. 272 of 2009 as amended'), as amended in 2012 (by S.I. No. 327/2012), 2015 (by S.I. No. 386/2015) and 2019 (by S.I. No. 77/2019).
- EC Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010 as amended), as amended in 2016 (S.I. No. 366 of 2016).
- EC Water Environment (Abstractions and Associated Impoundments) Regulations, 2024 (S.I. No. 419 of 2024).
- EU Environmental Impact Assessment (EIA) Directive 2011/92/EU as amended by 2014/52/EU.
- EU (Planning and Development) (EIA) Regulations S.I. No. 419 of 2012, as amended by S.I. No. 543 of 2014, 2018 (S.I. No. 296 of 2018), as amended by S.I. No. 404 of 2018 and S.I. No. 646 of 2018.

- The EU Floods Directive 2007/60/EC.
- EC (Assessment and Management of Flood Risks) Regulations, 2010 (S.I. No. 122 of 2010).
- EU (EIA) (Flood Risk) Regulations 2012 (S.I. No. 470 of 2012).
- Habitats Directive (1992/43/EEC).

10.2.2 Policy

The following policies are of relevance to the groundwater environment assessment and the proposed development:

- County Donegal Development Plan 2024-2030 (hereafter, CDDP) and associated mandatory objectives associated with conservation and protection of the environment and promotion of compliance with environmental standard.
- 'Seven Strategic Towns Local Area Plan 2018-2024' (hereafter, LAP) and associated policies.

10.2.3 Guidance

The following guidance documents are of relevance to the groundwater environment assessment and the proposed development:

- CIRIA (2006) *Control of Water Pollution from Linear Construction Projects (CIRIA 648)*.
- Department of Environment, Housing and Local Government (DoEHLG)/ Office of Public Works (OPW) (2009) *The Planning System and Flood Risk Management - Guidelines for Planning Authorities*.
- Environmental Protection Agency (EPA) (2022) *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EIAR)*.
- Environmental Protection Agency (EPA) (2003) *Advice notes on current practice (in the preparation of Environmental Impact Statements)*.
- Institute of Geologists of Ireland (IGI) (2013) *Guidelines for Preparation of Soils, Geology, Hydrogeology Chapters of Environmental Impact Statements*.
- National Roads Authority (NRA) (November 2008) *Environmental Impact Assessment of National Roads Schemes – A Practical Guide*.
- Transport Infrastructure Ireland (TII) (December 2025) *Water Impact Assessment for National Roads, Light Rail, Metro and Rural Cycleways – Overarching Technical Document (PE-ENV-01202)*.
- Transport Infrastructure Ireland (TII) (November 2024) *Environmental Impact Assessment of Rural Cycleways (Offline & Greenway) – A Practical Guide (PE-ENV-01109)*.
- TII (February 2024) *Drainage Systems for National Roads, (DN-DNG-03022)*.
- TII (February 2023) *Environmental Planning of National Road and Greenway Projects (RE-ENV-07008)*.
- TII (June 2015) *Road Drainage and the Water Environment (DN-DNG-03065)*.
- TII (December 2008) *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes PE-ENV-01116*.
- EPA (2008) *A Framework for the Assessment of Groundwater Dependent Terrestrial Ecosystems under the Water Framework Directive*.
- Working Group on Groundwater (2005) *Guidance on the application of groundwater risk assessment sheets SWRA 1-6 and GWDTERA 1-9 to areas designated for the protection of habitats and species'*.

10.3 Methodology

10.3.1 Proposed Development

10.3.1.1 Overview

The proposed development contains the following greenway elements:

- The centreline of the proposed greenway, including loops and spurs.
- Trailheads (four), to include car parking spaces and rest areas, and at three (Donegal, Ballybofey/ Stranorlar and Biddy's O'Barnes), to include water points and toilets (all mains connected).
- Structures, including three new underpasses, one overbridge, culverts and watercourse crossings.
- Drainage, including new over-the-edge and pre-earthworks drainage ditches, filter drains, carrier drains, attenuation swales, pipe or box culvert and permeable paving at trailheads.
- Earthworks to construct the greenway alignment, trailheads, drainage systems and associate infrastructure elements including new structures.
- Fencing and accommodation works.

The proposed development is described in full in EIAR Volume 2 Chapter 4: Description of the Proposed Development. On the abandoned railway corridor, minimal earthworks will be required as the vertical profile follows the existing profile for the majority. In offline greenfield areas, and on the approach to underpasses and bridges, cut and fill will be required in some locations.

The proposed development includes 91 no. structures, which consist of minor structures (culverts), new river bridges, existing structures (road and river crossings), one (1 no.) new underpass under the N56 and two (2 no.) new underpasses under the N15.

Mitigation measures that have been designed into the proposed development are referred to as 'embedded mitigation'. These measures, such as scheme drainage design and construction methodology as detailed in EIAR Volume 2 Chapter 4: Description of the Proposed Development, have been taken into consideration within the impact assessment.

10.3.1.2 Water and Wastewater

The source of water for drinking water sources and for toilet facilities along the proposed development, and the management of wastewater will be mains connected, where possible, and will be agreed with the water services section of Uisce Éireann and DCC, prior to commencement. Where not possible to connect to the mains sewer, and in accordance with PE-PMG-02047 and DN-GEO-03047, toilet facilities will be composting 'dry' toilets, managed by DCC.

10.3.1.3 Study Area

The study area for hydrogeological receptors encompasses the entire area within the proposed development extents (including land take, trailheads and construction compound areas) and water features within a 1km radius. This area is based on professional judgement and takes account of waterbodies (both surface and groundwater) within and adjacent to the proposed development, their immediate catchments, and any water-dependent habitats which could reasonably be affected, as well as downstream waterbodies and water-dependent habitats which are hydraulically connected to these waterbodies in which potentially significant impacts could arise.

10.3.2 Data Sources

The key hydrogeological receptors were identified, and the baseline condition of the hydrogeological environment was established by way of a desk study. The following sources of information have been consulted:

- EPA (2024), 'EPA Maps'¹.
- EPA (2024), 'EPA Catchments Map Viewer'².
- EPA (2024), 'EPA Hydronet Map Viewer'³.
- EPA (2006), 'EPA Water Abstraction Register'⁴.
- Geological Survey of Ireland (GSI) (2024), 'GSI Spatial Resources Map Viewer'⁵.
- GSI (2024), 'Groundwater Body Descriptions'⁶.
- National Parks and Wildlife Service (NPWS) (2024), 'NPWS Map Viewer'⁷.
- OPW (2023), 'Fluvial and Coastal Flood information mapping from the Catchment Flood Risk Assessment and Management Program (CFRAM)'⁸.
- Ordnance Survey of Ireland (OSI) (2024), 'GeoHive Map Viewer'⁹.
- Wetland Surveys Ireland (2024), 'Map of Irish Wetlands'¹⁰.
- Northwest Geotech, 2025. Ground Investigation Report, Barnesmore Gap Greenway (24-0069).

10.3.2.1 Site Investigations

A ground investigation (GI) programme was carried out by Northwest Geotech Ltd (NWG) along the proposed development on behalf of ROD-AECOM. The scope of this investigation was determined from analysis of existing information such as mapping and aerial photographs. The investigation utilised intrusive techniques such as cable percussion (CP) and windowless sampler (WS) boring, trial pitting (TP) and dynamic probing (DP). The findings of the GI programme were reported in the unpublished Ground Investigation Report Barnesmore Gap Greenway (NWG Report No: 24-0069, Revision A02, November 2025).

Groundwater was encountered during percussion boring through soil as water strikes at 0.30-5.00m in 7no boreholes, all other boreholes (20 no.) were dry. Groundwater was also encountered as seepage in a number of trial pits at depths of 0.90m to 2.80m.

Following completion of site works, groundwater monitoring data loggers were installed in five locations to monitor water levels on site for a period of one year. No groundwater was recorded at any of the locations.

Seasonal variation in groundwater levels should also be factored into design considerations.

10.3.3 Assessment Methodology

The methodology for this assessment follows the TII's *Water Impact Assessment for National Roads, Light Rail, Metro and Rural Cycleways – Overarching Technical Document* (2025)

¹ Available at: <https://gis.epa.ie/EPAMaps/Water> [Last accessed: April 2025]

² Available at: <https://www.catchments.ie/> [Last accessed: April 2025]

³ Available at: <https://epawebapp.epa.ie/hydronet/> [Last accessed: April 2025]

⁴ Available at: [Accessing water abstraction register and licensing files | Environmental Protection Agency](https://www.epa.ie/abstraction-register/) [Last accessed: February 2026].

⁵ Available at: <https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx> [Last accessed: April 2025]

⁶ Available at: <https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/> [Last accessed: April 2025]

⁷ Available at: <https://www.npws.ie/mapping> [Last accessed: April 2025]

⁸ Available at: <https://www.floodinfo.ie/> [Last accessed: April 2025]

⁹ Available at: <https://www.geohive.ie/> [Last accessed: April 2025]

¹⁰ Available at: <https://www.wetlandsurveys.ie/miw-intro> [Last accessed: April 2025]

(hereafter referred to as the 'TII 2025 Guidelines') for assessing the water environment, supplemented by the EPA's *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EIAR)* (2022) (hereafter referred to as the 'EPA Guidelines'). The assessment comprises of the following:

- Considering the **baseline status** of the water environment within the proposed development extent and study area and providing a rating of **receptor importance/sensitivity** using criteria from the TII 2025 Guidelines.
- Identifying the **likely impacts** of the proposed development on the water environment during the construction and operation phases, based on a source-pathway-receptor approach, and assigning of an **impact magnitude** using criteria from the TII 2025 Guidelines.
- Proposing suitable **embedded mitigation measures** to be incorporated into the development design.
- Reviewing any residual impacts and presenting **additional mitigation measures** where required.

10.3.3.1 Sensitivity of Receptor

A qualitative rating scale has been used to assign a sensitivity or value rating for hydrogeological receptors from **negligible** to **very high**, based on the TII (2025) Guidelines, and considers their likely adaptability, tolerance, and recoverability, as well as their designation, such as Drinking Water Protected Area (DWPA), Special Area of Conservation (SAC) and Ramsar Sites.

The criteria from the Table 3.1 of TII 2025 Guidelines has been used and presented in Table 10-1 below.

Table 10-1 - Receptor Sensitivity/ Importance (TII 2025 Guidelines)

Sensitivity/ Importance	Description	Example
Very High	Attribute has a high quality or value on international scale or national scale	• Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation (e.g. SAC or SPA status) or national legislation (e.g. NHA or ASSI (transboundary) status). • A groundwater body of hydrogeological importance to a habitat of very high value. • Groundwater provides significant baseflow to very high value surface water body. • Inner source protection area for regionally important water source.
High	Attribute has a high quality or value on local or county scale	• Regionally Important Aquifer. • Locally important potable water source. • Outer source protection area for regionally important water source. • Inner source protection area for locally important water source. • Groundwater provides significant baseflow to high value surface water body.
Medium	Attribute has a medium quality or value on local scale	• Locally Important Aquifer. • Outer source protection area for locally important water source. • Water source supplying large scale agriculture or industry. • Potable water source with 'moderate' or 'low' yield.

Sensitivity/ Importance	Description	Example
Low to Negligible	Attribute has a low or no quality or value on a local scale	- Poor Bedrock Aquifer with minimal abstractions. - A groundwater body which makes minimal contribution to sensitive or protected ecosystems.

10.3.3.2 Magnitude of Impact Criteria

A qualitative rating scale has been used to assign a magnitude of impact from **negligible** to **very high**, based on the TII (2025) Guidelines. The magnitude of impact considers the likelihood of an impact occurring, based on a scale of certain, likely or unlikely. Likelihood has been considered in the case of the assessment of potential impacts to water bodies only, as likelihood is inherently included within the FRA.

The criteria from the Table 3.3 of TII 2025 Guidelines has been used and presented in Table 10-2 below.

It should be noted that the control measures, as outlined in EIAR Volume 2 Chapter 4: Description of the Proposed Development, have been considered embedded in the design of the proposed development and their application has been assumed in determining the significance of the impact. Mitigation measures will be devised for each potential complete pollutant linkage (comprising a source, pathway and receptor), no matter how significant the impact. Additional mitigation measures have then been considered prior to determination of residual impacts.

Table 10-2 - Magnitude of Impact (TII 2025 Guidelines)

Impact Level	Description	Typical example
Very High	Major alteration to, or complete loss of, a receptor. Effects likely to be widespread, considered permanent and irreversible.	- Total loss of aquifer. - Changes to aquifer or zone of contribution¹¹ resulting in total loss of existing water supply springs and wells, river baseflow or GWDTEs. - Impact affects groundwater body and WFD status.
High	Notable permanent or longer-term change to a receptor.	- Removal of large proportion of aquifer. - Changes to aquifer or zone of contribution resulting in extensive change to existing water supply springs and wells, water quality, river baseflow or GWDTEs. - Potential high risk of pollution to groundwater from routine run-off. - In relation to Road/Greenways projects specifically: - Calculated risk of serious pollution incident >2% annually.
Medium	Moderate or longer-term change over a restricted extent or a moderate permanent change in a receptor.	- Removal of moderate proportion of aquifer. - Changes to aquifer or zone of contribution resulting in moderate change to existing water supply springs and wells, water quality, river baseflow or GWDTEs. - Impact affects groundwater body, but no effect on the WFD status. - Potential medium risk of pollution to groundwater from routine run-off. - In relation to Road/Greenways projects specifically: - Calculated risk of serious pollution incident >1% annually.

¹¹ Zone of Contribution: the area at ground surface that contributes to a receptor. For example, the area at land surface that is likely to contribute water to a groundwater abstraction or GWDTE (TII, 2025 Guidelines).

Impact Level	Description	Typical example
Low	Minor short- or medium-term change over a restricted extent or a minor permanent change in a receptor.	- Removal of small proportion of aquifer. - Changes to aquifer or zone of contribution resulting in minor change to water supply springs and wells, water quality, river baseflow or ecosystems. - Impact does not affect groundwater body, and WFD status remains unchanged. - Potential low risk of pollution to groundwater from routine run-off. - In relation to Road/Greenways projects specifically: - Calculated risk of serious pollution incident >0.5% annually.
Negligible	Minor momentary change over a localised extent or imperceptible change to a receptor.	- In relation to Road/Greenways projects specifically: - Calculated risk of serious pollution incident <0.5% annually.

10.3.3.3 Quality of Impact

The quality of impact has been assigned based on the TII 2025 Guidelines, considering that impacts can be identified as:

- **Positive** – a change which improves the quality of the environment
- **Neutral** – no effects or effects that are imperceptible
- **Negative** – a change which reduces the quality of the environment

10.3.3.4 Duration of Impact

The magnitude of an effect is a function of its extent, intensity, complexity, probability, duration, frequency and reversibility. The TII 2025 Guidelines refers to the categories for describing effects in the EPA Guidelines and does not in themselves provide a clear definition of the terms relevant to the duration of impact. The term definitions are taken from the NRA (2008) Guidelines, as provided below:

- **Momentary** – lasting from seconds to minutes
- **Brief** – lasting less than a day
- **Temporary** – construction-related and lasting less than a year
- **Short-term** – lasting 1 to 7 years
- **Medium-term** – lasting 7 to 15 years
- **Long-term** – lasting 15 to 60 years
- **Permanent** – lasting over 60 years

10.3.3.5 Significance of Effects

The significance of effects in the TII (2025) Guidelines refers to the criteria provided by the EPA Guidelines. The magnitude of impact criteria (Table 10-2) is combined with the sensitivity or value rating of the receptor (Table 10-1) to determine the significance of effect (see Plate 10-1). Any ratings of effect significance of less than moderate will not be considered *significant*. The EPA Guidelines focus on the likely *significant* effects on the environment with the guidance stating that effects which fall outside of this description need not be assessed as part of the EIA process.

The significance of effects is rated as follows:

- **Imperceptible** – an effect capable of measurement but without significant consequences.

- **Not significant** – an effect which causes noticeable changes in the character of the environment but without significant consequences.
- **Slight** – an effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
- **Moderate** – an effect which alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
- **Significant** – an effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment.
- **Very Significant** – an effect which, by its character, magnitude, duration or intensity, significantly alters most of a sensitive aspect of the environment.
- **Profound** – an effect which obliterates sensitive characteristic

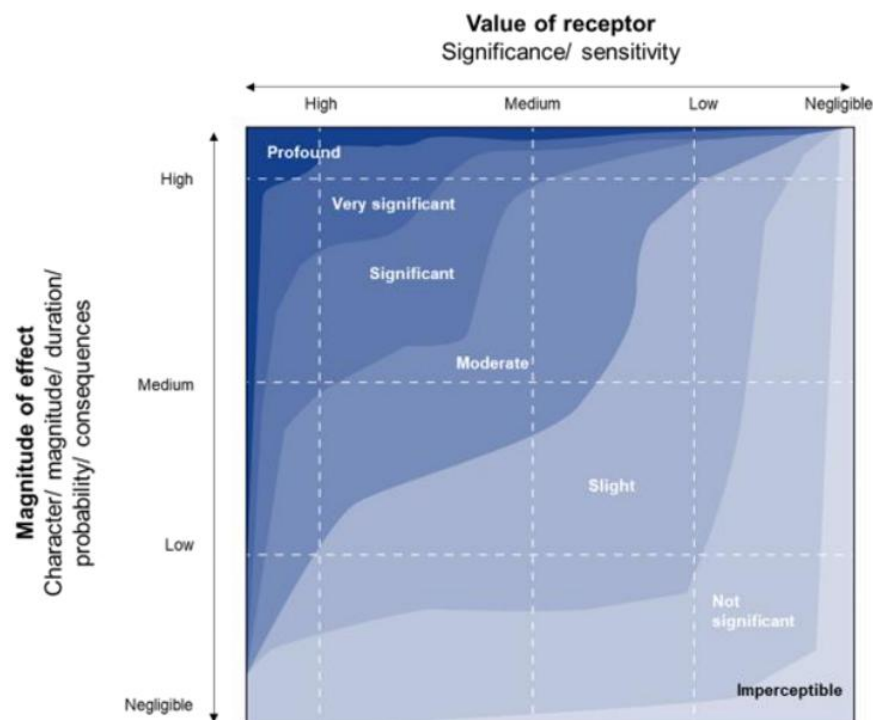


Plate 10-1 - Significance of Effect Rating (TII 2025 Guidelines)

10.3.3.6 Indirect (or secondary) Impacts

The TII 2025 Guidelines state that *indirect and secondary effects* are those that are not a direct result of the project and are often produced away from the project site or because of a complex pathway.

The assessment considers both the potential *direct and indirect effects* of the proposed development on the water environment, by virtue of the consideration of groundwater in combination, the ecosystems and abstractions which are dependent on the water environment, and the flood risk which is controlled by the water environment. The assessment not only considers the immediate water receptor but also any sensitive water receptors which are in hydraulic connection and have the potential to be impacted by the proposed development. Therefore, the assessment of indirect and secondary effects is intrinsically considered within the assessment of *significant effects* on the water environment, by virtue of this holistic approach.

10.3.4 Assumptions and Limitations

The baseline position of the water table is based on observed water strikes, where available. However, it should be noted that these water strikes are a snapshot of the position of the water table in time and in location, and in the absence of data from the groundwater monitoring data

loggers included in the site investigation, it is unclear if these are representative of the water table or indeed if the absence of observed water strikes is representative of the absence of groundwater.

The baseline condition of the water environment, including WFD status, is based on publicly available information and a walkover survey undertaken in August 2025 to inform the WFD assessment, included in Appendix 9.1 in Volume 4 of this EIAR.

Water quality will be considered in the assessment based on publicly available information; Water quality sampling has not been undertaken for the purpose of this assessment as all mitigation has been developed on the basis that the risk of pollution is minimised. Prior to construction, water sampling should be undertaken, preferably for a year, to compare any water quality issues during construction with a reasonable baseline pre-construction dataset.

10.4 Receiving Environment

The EIA Directive requires: *“A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge”*.

The environment will change over time, even without the introduction of the proposed development. Therefore, the EIAR must include a description of the likely evolution of the environmental factor in the absence of the proposed development. This predicted changing baseline may be referred to as ‘the likely future receiving environment’.

10.4.1 Study Area Description

The proposed greenway is approximately 31km in length and 3-4m in width with 1m verges either side (with variations of up to one metre depending on obstacles and proximity to built-up areas), between the south of Stranorlar town and the north of Donegal Town, with a further 6.5km of spurs and loops to provide additional connectivity and integration to the surrounding areas, trailheads (four) and construction compound areas.

The proposed development and study area are predominantly characterised by agricultural land use, namely grazing for livestock. The proposed development crosses four urban development areas, i.e., from southwest to northeast, Donegal Town, Tinnycahill, Ballybofey and Stranorlar, all of which contain a mixture of residential, commercial, and industrial properties.

10.4.2 Hydrogeology

The geology within the proposed development extent and study area is described and assessed in EIAR Volume 2 Chapter 8: Land and Soils, which should be read in conjunction with this chapter.

10.4.2.1 Aquifers

According to the GSI’s Map Viewer, the proposed development is underlain from northeast to southwest by Precambrian Quartzites, Gneisses and Schist, Granites and other Igneous Intrusive rocks, Dinantian (early) Sandstones, Shales and Limestones, Dinantian Lower Impure Limestones, Dinantian Sandstones, Dinantian Pure Bedded Limestones, and Dinantian Shales and Limestones hydrostratigraphic units¹² (see Table 10-3 below and Superficial Deposits and Bedrock Aquifer D 60701883-ACM-EGN-SW_ZZ_ZZ_ZZ-DR-EN-1005 in Volume 3 of this EIAR).

¹² The Hydrostratigraphic Rock Unit Groups map is a reclassification of the 1:100,000 bedrock geology map, created by grouping bedrock formations and members into 27 Rock Unit Group categories based on their hydrogeological properties and other factors.

Table 10-3 - Aquifers Underlying the proposed development and study area

Geological Formation	Hydrostratigraphical Unit	Aquifer Classification
Lough Eske Psammite Formation	Precambrian Marbles, Gneisses and Schist	PI – Poor Aquifer – Bedrock which is Generally Unproductive except for Local Zones
Lough Mourne Formation		
Barnesmore Granite, G2 variety	Granite and other Igneous Intrusive rocks	
Barnesmore Granite, G3 varieties of complex		
Dolerite		
Basal sandstones	Dinantian (early) Sandstones, Shales and Limestones	LI – Locally Important bedrock aquifer which are moderately productive only in Local Zones
Argillaceous Limestones and Calcareous Shales Facies	Dinantian Lower Impure Limestones	
Bundoran Formation	Shale	Dinantian Shales and Limestones
Ballyshannon Formation	Limestone	Dinantian Pure Bedded Limestones
		Rk – Regionally Important Aquifer Lk – Locally Important karstified bedrock aquifer – where outcrops adjacent to Lough Eske
Banagher Formation	Sandstone	Dinantian Sandstones
		Lm – Locally Important Aquifer – Bedrock which is Generally Moderately Productive

While there are no mapped superficial deposit (sand and gravel) aquifers, the water table within the study area is likely to be high, i.e., within 5m of the ground surface, within the superficial deposits and to be closely linked with surface water bodies.

Table 10-4 below summarises the boreholes and trial pits that have encountered groundwater strikes, their total depth, the depth of the groundwater strike and the corresponding lithology. The maximum depth that groundwater was encountered was at 5 mbGL. Most boreholes were terminated due to encountering bedrock and so the groundwater levels are more representative of the superficial deposits particularly where the bedrock and overlying superficial deposits are in poor hydraulic connectivity.

It should be noted that any observed water strikes are a snapshot of groundwater levels in time and in location, and in the absence of continued groundwater monitoring, it is unclear if water strikes are representative of the water table or indeed if the absence of observed water strikes is representative of the absence of groundwater (see Geotechnical Investigation Layout Drawing 60701883-ACM-HGT-SW_ZZ_ZZ_ZZ-DR-ER-0020-0036 in Volume 3 of this EIAR).

Table 10-4 - Summary of groundwater strikes from GI investigations

Number	Type	Total depth (m)	Depth to groundwater (m)	Unit
EGBH07	Borehole	3.00	2.00	CLAY
EGBH01	Borehole	5.82	5.00	CLAY
EGBH03	Borehole	2.74	2.00	CLAY
EGHB04	Borehole	2.63	2.00	SILT
EGBH09	Borehole	2.18	1.20	CLAY
EGBH13	Borehole	0.43	0.30	CLAY
EGBH15	Borehole	1.93	1.90	GRAVEL
PT01	Trial pit	1.80	1.50	SILT

Number	Type	Total depth (m)	Depth to groundwater (m)	Unit
PT02	Trial pit	2.20	0.73	PEAT
PT06	Trial pit	1.45	0.60	PEAT
TP002	Trial pit	2.20	2.10	COBBLES
TP005	Trial pit	3.00	1.90	PEAT
TP006	Trial pit	2.20	2.20	SILT
TP007	Trial pit	0.95	0.90	CLAY
TP010	Trial pit	2.20	2.05	GRAVEL
TP011	Trial pit	1.50	1.50	CLAY
TP012	Trial pit	3.00	2.80	GRAVEL
TP012A	Trial pit	1.20	1.10	SILT
TP014	Trial pit	3.00	2.80	PEAT
TP015	Trial pit	2.20	1.90	GRAVEL
TP017	Trial pit	1.80	1.70	PEAT
TP018	Trial pit	2.80	2.25	GRAVEL
TP020	Trial pit	1.80	1.20	GRAVEL
TP021	Trial pit	2.70	1.30	PEAT
TP027	Trial pit	2.40	1.50	GRAVEL
TP034	Trial pit	2.90	2.70	GRAVEL

10.4.2.2 WFD Groundwater bodies

WFD groundwater bodies are subdivisions of large geographical areas of aquifers so that they can be effectively managed to protect the groundwater and linked surface waters in line with the WFD. The proposed development and study area are underlain by four WFD groundwater bodies, from northeast to southwest: Ballybofey, Castlederg, Donegal South, and Donegal-Ballintra. The study area includes two other WFD groundwater bodies: Doorin Point and Inver-Banagher Hill. There are no listed significant pressures¹³ for these groundwater bodies.

The most up to date WFD status available to this study is from 2016-2021 and the most up to date WFD Risk status is from the 3rd Cycle of reporting. These are summarised in Table 10-5 and WFD Groundwater Body Status and Risk Mapping Drawing 60701883-ACM-EGN-SW_ZZ_ZZ_ZZ-DR-EN-1006 in Volume 3 of this EIAR.

Table 10-5 - WFD Groundwater Bodies

WFD groundwater body	Traversed by Proposed Development	WFD status (2016-2021)	WFD risk (3 rd Cycle)
Ballybofey	Yes	Good	Not at risk
Castlederg		Good	Not at risk
Donegal South		Good	Not at risk
Donegal-Ballintra		Good	Not at risk
Doorin Point	No	Good	Not at risk
Inver-Banagher Hill		Good	Not at risk

The hydrogeological characteristics of the WFD groundwater bodies traversed by the proposed development, as described by the GSI, are outlined below:

¹³ Significant pressures are identified for waterbodies that are At Risk of not meeting their water quality objectives under the WFD. While there are a multitude of pressures in every waterbody, the significant pressures are those that need to be addressed to improve water quality.

- The Ballybofey WFD groundwater body¹⁴ is a poor aquifer which is generally unproductive, with low transmissivity rocks. Most flow will occur in the *“uppermost part of the aquifer comprising: a broken and weathered zone typically less than 3m thick; a zone of interconnected fissuring typically 10-15m; and a zone of isolated fissuring typically less than 150m”*. The water level will be between 0 and 15m below ground level (mbGL) and will follow topography. Groundwater flow path lengths will be relatively short, between 30 and 300 m, and groundwater will discharge to nearby seeps, streams and small springs.
- The Donegal South WFD groundwater body¹⁵ is mainly a poor aquifer except in the south where it is locally important that is moderately productive in local zones. The transmissivity is likely to be low, around 20-30 m³/day. Most flow will occur in the *“uppermost part of the aquifer, comprising a broken and weathered zone typically less than 3m thick; a zone of interconnected fissuring typically less than 10m; and a zone of isolated fissuring typically less than 150m”*. The groundwater level will likely be between 0 and 5 mbGL. Groundwater flow path lengths will be relatively short, between 30 and 300 m, and groundwater will discharge to nearby streams and small springs.
- The Donegal-Ballintra WFD groundwater body¹⁶ a regionally important karstified aquifer, with transmissivities ranging from 2 to 2,000 m²/d. The presence of highly permeable zone reduces the transmissivity to the lower-mid end of the scale. The storativity of the aquifer is low and the groundwater flow is diffuse, rapid and to the west, where it is discharging to the sea. The groundwater level will likely be between 0 and 3 mbgl, with a component of deep groundwater flow.

The Castlederg WFD groundwater does not have an assigned GSI groundwater body description.

10.4.2.3 Permeability, Groundwater Vulnerability and Recharge

The GSI has mapped the permeability of superficial deposits to classify how easy water can infiltrate these deposits downwards at any point in the land surface. According to the GSI's Map Viewer, the proposed development and study area are underlain by superficial deposits of low permeability, where mapped. The alluvium associated with the Lowerymore_020 WFD river waterbody is mapped as being of moderate permeability. Around Stranorlar and along the N15 road close to the town, a large band of superficial deposits, Till derived from Metamorphic rocks and alluvium associated with the Finn (Donegal)_060 and Burn Durnett_010 river waterbodies, are of moderate permeability.

The GSI has mapped the vulnerability of groundwater to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. The proposed development and study area are mapped as having extreme groundwater vulnerability to contamination where significant outcropping and subcropping bedrock, and karstified bedrock are mapped, and either high or moderate groundwater vulnerability to contamination for the remainder of the proposed development extent and study area. Pockets of low groundwater vulnerability to contamination are mapped south of Lough Eske.

The GSI has mapped groundwater recharge to provide an estimate of the average amount of rainwater that percolates down through the superficial deposits to the water table over a year (see Groundwater Vulnerability and Karst Landforms Drawing 60701883-ACM-EGN-SW_ZZ_ZZ_ZZ-DR-EN-1004 in Volume 3 of this EIAR). The proposed development and study area to the north of Lough Eske are mapped as being underlain by superficial deposits with recharge coefficients in the range of 4 to 10% (51-100mm), with a pocket located close to Lough Eske underlain by recharge coefficient of 4% (1-50mm). To the south of Lough Eske,

¹⁴ [Ballybofey GWB: Summary of Initial Characterisation - 1st Draft Ballybofey Description July 2004](#)

¹⁵ [Donegal South GWB: Summary of Initial Characterisation - 1st Draft Donegal South GWB Description July 2004](#)

¹⁶ [Donegal Ballintra: Summary of Initial Characterisation - 1st Draft Donegal-Ballintra GWB Description July 2004](#)

the proposed development is underlain by a variable recharge coefficient in the range of 4 to 25% (51-400mm) with tiny pockets of high recharge coefficient of 85% (1001-1400mm).

10.4.2.4 Groundwater Abstractions and Source Protection Zones

According to the GSI's Map Viewer, there are 59 no. recorded wells and springs located within the study area (see Table 10-6 see Groundwater vulnerability and Groundwater abstractions, karst features and SPZs Drawing 60701883-ACM-EGN-SW_ZZ_ZZ_ZZ-DR-EN-1002 in Volume 3 of this EIAR). None of these wells are recorded as being used for public water supply or group water supply purposes, with most recorded as being used for agricultural and domestic supply purposes. These supplies are likely to abstract less than 25 m³/ day, as this is the volume at which an abstraction is required to be registered under the Water Environment (Abstractions and Associated Impoundments) Act 2022 and associated Regulations. There is no publicly available information to suggest that these are active or inactive. Table 10-6 summarises all these records and their distance from the proposed development.

According to the EPA's Abstraction Register, there are no registered groundwater abstractions located within the study area.

Based on the GSI's WFD Groundwater Body Descriptions (see Section 10.4.2.2), the groundwater flow paths within the study area are typically less than 300 m. Based on the GSI's arbitrary fixed radius method to delineate Inner Protection Areas for high yielding public water supply sources of 300m, the Zones of Contribution (ZOCs) to the recorded groundwater abstractions in low transmissivity rocks are likely to be less than 300 m. Therefore, the potential for the recorded groundwater abstractions beyond 300 m from the proposed development is low, therefore the assessment considers the recorded groundwater abstractions located within 300m only.

According to the GSI's Map Viewer and the EPA's Map Viewer, there are no Source Protection Areas (SPAs) mapped within the study area. SPAs are delineated by the GSI to protect groundwater drinking water sources from microbial pollution.

In addition, there are no ZOCs areas mapped within the proposed development or the study area for EPA groundwater monitoring boreholes or group water schemes. ZOCs refer to the catchment area that contributes groundwater to the well or spring.

Table 10-6 - GSI Well Records within the study area

GSI ID	Type	Townland	Easting	Northing	Depth (m)	Depth to bedrock (m)	Well yield (m ³ /day)	Usage	Approx. distance from the proposed development (m)
2039SWW003	Dug well	Goland	211020	392480	1.8	-	Poor	Unknown	Crossing the Proposed Development
2039SWW001	Borehole	Drumboe lower	213890	395360	31	5.2	-	Agriculture and Domestic only	Crossing the Proposed Development
1737NEW001	Borehole	Drumnacarry	196270	381420	33.5	-	Poor	Unknown	Crossing the Proposed Development
1737SEW117	Dug well	Drumlonagh	193980	379200	1.2	-	-	Other	30
1737NEW007	Borehole	Spierstown	196230	380180	3.6	-	-	Other	30
2037NWW011	Borehole	Ardinawark	201240	383990	6	-	-	Other	90
2037NWW012	Borehole	Ardinawark	201520	384170	5	-	-	Other	95
1737NEW011	Borehole	Mullanalamphry	198900	382200	12	-	-	Other	110
1737NEW013	Borehole	Mullanalamphry	199010	382260	-	-	-	Other	110
1737SEW092	Dug well	Drumlaght	193850	378920	2.8	2.6	-	Other	120
2037NWW010	Borehole	Keadew lower	201140	383930	4	-	-	Other	120
1737SEW118	Dug well	Drumlonagh	194200	379150	3.5	-	-	Other	130
1737NEW012	Borehole	Mullanalamphry	198970	382230	15	-	-	Other	130
2037NWW008	Borehole	Keadew lower	200370	383240	12	2.5	-	Other	145
2037NWW009	Borehole	Keadew lower	200530	383360	18	0.7	-	Other	180
1737SEW116	Borehole	Drumroosk Middle	193660	379220	5	-	-	Other	200
2039SWW015	Borehole	Blackburn bridge	210440	392200	3.5	3.5	-	Other	240
1737SEW090	Dug well	Milltown	193310	378610	2.5	1.5	-	Other	260
1737SEW098	Borehole	Mullans	192890	378620	2.4	0.8	-	Other	260
1737SEW093	Dug well	Drumlongher	193940	378830	2.3	-	-	Other	270
1737SEW091	Dug well	Mullans	192860	378620	0.9	0.8	-	Other	280
1737SEW101	Borehole	Mullans	192860	378610	0.9	0.8	-	Other	280

GSI ID	Type	Townland	Easting	Northing	Depth (m)	Depth to bedrock (m)	Well yield (m ³ /day)	Usage	Approx. distance from the proposed development (m)
1737SEW094	Borehole	Drumroosk West	193730	378670	3.2	2.8	-	Other	290
1737NEW006	Borehole	Cullionboy	199930	382450	75	3.8	-	Unknown	290
1737NEW008	Borehole	Drumnagahan	196460	380390	5.5	-	-	Other	320
2037NWW002	Borehole	Ardinawark	200570	383680	48	-	Poor	Domestic only	320
2037NWW004	Borehole	Ardinawark	200960	384050	41	-	Poor	Domestic only	320
1737SEW095	Dug well	Doonan	193080	378520	4.7	1.8	-	Other	340
1737SEW115	Dug well	Drumroosk Middle	193450	379260	3	-	-	Other	350
2037NWW005	Borehole	Ardinawark	200510	383650	57	15	Poor	Domestic only	350
1737SEW064	Borehole	Donegal	194240	378880	2.5	1.8	-	Other	360
2037NWW003	Borehole	Ardinawark	201060	384200	55	-	Poor	Domestic only	370
1737SEW109	Dug well	Drumlonagher	194500	379050	1.7	-	-	Other	385
1737SEW096	Dug well	Mullans	192840	378490	1.4	1.3	-	Other	400
1737SEW114	Borehole	Drumroosk West	193050	379280	4	-	-	Other	400
1737SEW108	Borehole	Drumlonagher	194740	379180	5	2	-	Other	410
1737NEW010	Borehole	Drumnagahan	196820	380740	4	3.5	-	Other	420
1737SEW107	Borehole	Clarcaricknagun	194950	379300	4	2.5	-	Other	425
1737SEW106	Borehole	Tinnycahill	195100	379400	4	2	-	Other	430
1737NEW015	Borehole	Birchhill	197450	381290	10	1.7	-	Other	460
1737SEW113	Borehole	Drumroosk West	192730	379220	3.6	3.4	-	Other	465
1737SEW111	Dug well	Drumroosk West	192600	379100	2.5	-	-	Other	480
1737NEW014	Borehole	Birchhill	197440	381230	10	4	-	Other	480
1737SEW112	Dug well	Drumroosk West	192720	379250	-	-	-	Other	500
1737NEW020	Borehole	Ardnabask	199210	383040	72	7	Poor	Agriculture and Domestic only	540
1737SEW100	Borehole	Donegal	193850	378440	2	0.9	-	Other	550

GSI ID	Type	Townland	Easting	Northing	Depth (m)	Depth to bedrock (m)	Well yield (m ³ /day)	Usage	Approx. distance from the proposed development (m)
1737NEW009	Borehole	Drumnagahan	196610	380520	3.5	2	-	Other	550
1737SEW110	Dug well	Mullans	192440	378800	3	-	-	Other	580
2037NWW015	Borehole	Tawnaghlahan	200280	383780	80	3.5	Poor	Agriculture and Domestic only	610
2037NWW016	Borehole	Tawnaghlahan	200020	383610	81	4.5	Poor	Agriculture and Domestic only	650
1737SEW142	Borehole	Clarcam	196780	379790	10.8	-	-	-	665
1737SEW102	Borehole	Donegal	192790	378180	6.6	3.5	-	Other	710
2037NWW001	Borehole	Tawnaghlahan	200100	383730	38	-	Poor	Domestic only	710
1737NEW018	Borehole	Tawnaghlahan	199700	383480	60	8	Poor	Agriculture and Domestic only	720
1737SEW119	Borehole	Drumrat	194580	378680	12.3	-	-	Other	730
1737SEWO78	Borehole	Doonan	192260	379040	3.5	2.6	-	Other	780
1737SEW099	Borehole	Donegal	192640	378090	5	3.4	-	Other	830
1737SEW104	Borehole	Ardeskin	193790	378030	2.5	-	-	Other	900

10.4.2.5 Groundwater Levels and Flows

According to the GSI's Groundwater Level Data Viewer, there are two groundwater level monitoring locations within the study area, in the town of Stranorlar – St Columbas BH01 (deep) and St Columbas BH02 (shallow). No information on the depth of these boreholes is available; however, these boreholes do appear to be located within the Lough Eske Psammite Formation and the Ballybofey WFD groundwater body. The readings are presented in the Plate 10-2.

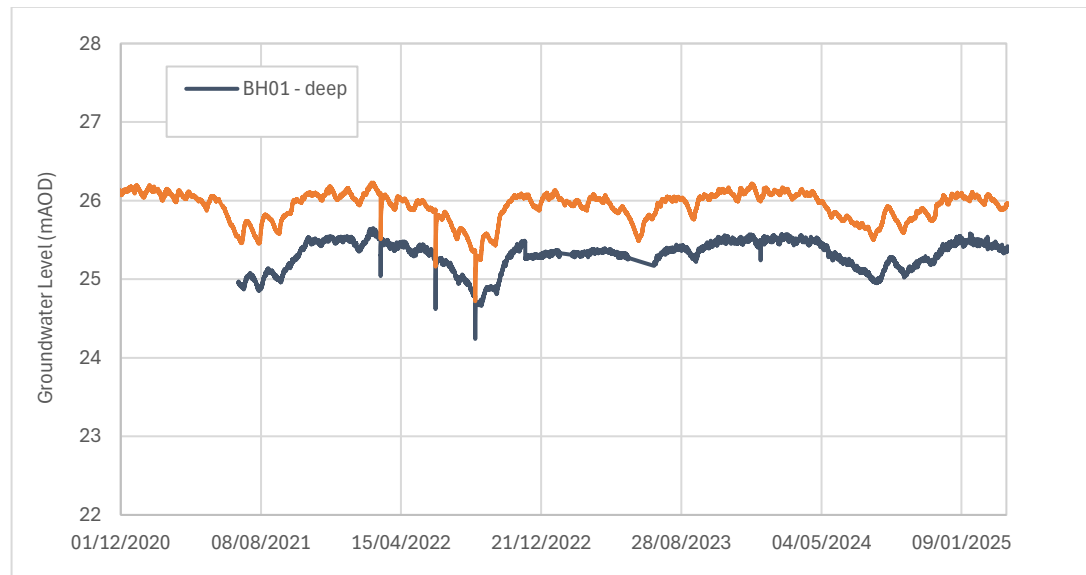


Plate 10-2 - Groundwater level monitoring data at St Columbas in Ballybofey WFD groundwater body

10.4.2.6 Groundwater Quality

According to the EPA's Map Viewer, there are no National Water Monitoring Stations located within the Study Area. The closest groundwater monitoring station, Parkhill (Ballyshannon) (GWIE_NW_G_07206000003), is located at approximately 14.5km to the south of the proposed development.

10.4.2.7 Groundwater Flood Risk

The GSI have developed Groundwater Flood Probability Maps which show the probabilistic flood extent of groundwater flowing as well as historic groundwater flooding extents. According to the GSI's Groundwater Flooding Data Viewer, there are no areas with a probability of groundwater flooding or historical flooding due to groundwater within the proposed development extent or the study area.

10.4.2.8 Groundwater Dependent Terrestrial Ecosystems

There is no central or comprehensive repository of groundwater dependent terrestrial ecosystems (GWDTEs) in Ireland. The mapping of designated/ protected sites by the NPWS and the mapping of non-designated sites, using karst landforms recorded by the GSI and wetland habitats recorded by Wetland Surveys Ireland¹⁷ has been examined. Guidance produced by the WFD Working Group on Groundwater¹⁸ and by the EPA¹⁹ provides a useful list of habitats which can be directly dependent on groundwater and has been reviewed to identify those qualifying interests and habitats of relevance to water. These are summarised

¹⁷ [Map of Irish Wetlands - Wetland Surveys Ireland and Foss Environmental Consulting](#)

¹⁸ Working Group on Groundwater, 2005. Guidance on the application of groundwater risk assessment sheets SWRA 1-6 and GWDTERA 1-9 to areas designated for the protection of habitats and species.

¹⁹ Environmental Protection Agency, 2008. A Framework for the Assessment of Groundwater – Dependent Terrestrial Ecosystems under the Water Framework Directive. Environmental Research Centre, Report Series No. 12.

Table 10-7 and Table 10-8 and in Groundwater Dependent Terrestrial Ecosystems Drawing 60701883-ACM-EGN-SW_ZZ_ZZ_ZZ-DR-EN-1007 in Volume 3 of this EIAR.

The desk-based findings were supplemented by the field findings from habitat surveys undertaken by the project Biodiversity team, between 2024 and 2025. The findings have been reviewed and compared against the WFD Working Group on Groundwater (2005) and the EPA (2008) guidance. While the field study area includes an area of up to 50m around the proposed development extent, the hydrogeology assessment examines the survey findings plus desk-based information for GWDTEs located within a 1km radius of the proposed development extent (including land take, trailheads and construction compound areas). This area is based on professional judgement and takes account of the GWDTEs and their Zones of Contribution (ZOC) which could reasonably be affected.

The sensitivity of each of the identified GWDTEs has been assigned based on the EPA (2008) guidance, as referred to in Appendix D of the TII 2025 Guidelines. In the absence of detailed site-specific information, it is not possible to delineate the ZOCs to the identified GWDTEs with any certainty or accuracy; however, it has been assumed that the ZOCs have been considered in the assessment using the arbitrary fixed radius method of 1,000m, as outlined in the TII 2025 Guidelines and in the publication 'Groundwater Protection Schemes' (DoELG / EPA / GSI, 1999). The study area for hydrogeological receptors, which encompasses the entire area within the proposed development extents (including land take, trailheads and construction compound areas) and water features within a 1km radius, is considered to account for these ZOCs.

Table 10-7 - Designated GWDTEs within the study area

ID	Name	Type	Habitats of relevance to water [EU Habitat Code]	Approx. distance from the Proposed Development (m)
002301	River Finn	SAC	Wet heaths [4010] Blanket bogs [7130] Transition mires and quaking bogs [7140] Oligotrophic Waters [3110]	Crossing the Proposed Development
002437	Meenagarranroe Bog	NHA	Peatlands [4]	420
002452	Lough Hill Bog	NHA	Peatlands [4]	430
000122	Cashelnavean Bog	NHA	Peatlands [4]	Immediately adjacent
000129	Croaghonagh Bog	SAC pNHA	Blanket bogs [7130]	Immediately adjacent
002375	Barnesmore Bog	NHA	Peatlands [4]	Immediately adjacent
000163	Lough Eske and Ardnamona Wood	SAC	Petrifying springs [7220] Oligotrophic Waters [3110]	Traversed by proposed development multiple times
004151	Donegal Bay	SPA	Wetlands [A999]	370
000133	Donegal Bay (Murvagh)	SAC pNHA	Mudflats [1140] Humid dune [2190]	

Table 10-8 - Non-designated GWDTEs within the study area

Name	Status	Wetland type	Approx. distance from the Proposed Development (m)
Lougheask Demesne wet woodland	B Rating: Nationally Important	River, wet woodland (oak ash or willow alder)	Traversed by Proposed Development

Name	Status	Wetland type	Approx. distance from the Proposed Development (m)
Loughs Craig and Cullionboy	F Rating: Unknown value – survey required	Lake, reed swamp, river, wet grassland, scrub	60
Lough Amincheen lakes complex	F Rating: Unknown value – survey required	Lake, river, wet heath, lowland bog, scrub	390
Lough Nabreen	F Rating: Unknown value – survey required	Lake, river, wet heath, wet grassland	960
Lough Mourne and cutover	F Rating: Unknown value – survey required	Lake, reed swamp, river, wet grassland, cutover bog, scrub	Traversed by proposed development
Corraire Meencrumlin complex	F Rating: Unknown value – survey required	River, wet grassland, upland bog, cutover bog, fen, scrub	115
Various	County importance	Wet heath [4010] identified during ecology survey	Traversed or immediately adjacent to proposed development
Raised bog at chainage 7625	Local importance (higher value)	Raised bog [7110] identified during ecology survey	50
Blanket bog at chainage 5950 and between chainage 12150 - 16150	Ch. 5950: Local importance (higher value) Ch. 12150 – 16150: County importance	Blanket bog [7130] identified during ecology survey	Traversed or immediately adjacent to proposed development

10.4.2.9 Karst landforms

Karst is a landscape with distinctive hydrology and landforms that arise when the underlying rock is soluble and principally occurs in the Carboniferous (Dinantian) Limestone in Ireland²⁰. Table 10-9 provides detail on those landforms relevant to this assessment (see Groundwater Vulnerability and Karst Landforms Drawing 60701883-ACM-EGN-SW_ZZ_ZZ_ZZ-DR-EN-1004 in Volume 3 of this EIAR). The identified karst landforms, other than the springs, are not considered as water environment receptors in themselves, but rather as pathways for the rapid migration of pollutants into the underlying aquifer and WFD groundwater body. The presence of karst landforms indicates that there is potential for more unrecorded features.

Table 10-9 - GSI Karst Landforms records within the study area

GSI ID	Karst landform type	Approx. distance from the proposed development (m)
IE_GSI_Karst_40K_338	Spring ²¹	8 from CPO boundary
IE_GSI_Karst_40K_448	Swallow Hole ²²	200
IE_GSI_Karst_40K_2457	Spring ("Spa Well")	Traversed by the proposed development where on embankment
IE_GSI_Karst_40K_4179	Enclosed Depression ²³	280

²⁰ <https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-irish-karst/Pages/default.aspx>

²¹ A spring is a point in the hillside where water seeps or bubbles from the limestone. It differs from a resurgence, where a stream or river emerges and it differs from exurgence, where only percolating rainwater emerges.

²² Swallow holes are sinkholes down which a river or stream disappears via a fissure or shaft to join the subterranean drainage system below. Downstream of the swallow hole, a dry valley may occur.

²³ Enclosed depressions are regarded as the most common landforms of karst. They function to funnel rainfall and runoff vertically down to become recharge. They range in diameter from a few metres to tens of kilometres and in depth from a few centimetres to hundreds of metres. The smallest of these features are termed dolines.

The springs identified are referred to as 'low yielding' in the GSI's *Donegal South WFD groundwater body description* ²⁴ and there is no GSI record of these springs being used for supply purposes.

10.4.3 Conceptual Model

A hydrogeological conceptual model has been developed to allow for a robust assessment of the potential for effects arising from the proposed development. The conceptual model is based on the information available to this assessment and considers receptors, pathways for effects and source of effects. The conceptual model can be divided into three distinct zones, based on the aquifers underlying the proposed development, as follows:

- **Zone 1** (Ch.0 – 3+950): This zone is characterised by the regionally important aquifer, the Ballyshannon Limestone Formation. This formation is classified as Dinantian Pure Bedded Limestones and as karstified limestone, but dominated by diffuse groundwater flow, rather than conduit flow. Most of the groundwater flow will be in the top 30 m of the aquifer and towards the sea to the west. The bedrock aquifer is predominantly overlain by till of low permeability and is likely to be in close hydraulic continuity with the surface water environment, where subsoils are thin or absent. The bedrock aquifer supports the Donegal Bay (Murvagh) SAC and the Lough Eske and Ardnamona Wood SAC through groundwater contributions and baseflow and is the likely source of water for groundwater abstractions in this zone, in the absence of a superficial deposit aquifer. Any excavations within this zone are likely to encounter groundwater in the till or in shallow bedrock at between 0 and 3 mbGL. The pathway for effects on the hydrogeological receptors is shallow groundwater in the till or in shallow bedrock. The source of effects on the hydrogeological receptors is the construction, excavation and potential associated dewatering for the N56 underpass, cuttings, and watercourse crossings within this zone.
- **Zone 2** (Ch. 3+960 – 7+150): This zone is characterised by the locally important aquifer, the Argillaceous Limestones and Calcareous Shales Facies and the Basal Sandstone. These formations are classified as Dinantian Lower Impure Limestones and Dinantian (early) Sandstones, Shales and Limestones respectively and as low transmissivity rocks. Most of the groundwater flow will be in top 10 m of the aquifer and towards the south and east, as determined by topography. The bedrock aquifer is predominantly overlain by till of low permeability and is likely to be in close hydraulic continuity with the surface water environment, where subsoils are thin or absent. The bedrock aquifer supports the Lough Eske and Ardnamona Wood SAC through groundwater contributions and baseflow and is the likely source of water for groundwater abstractions in this zone, in the absence of a superficial deposit aquifer. Any excavations within this zone are likely to encounter groundwater in the till or in shallow bedrock at between 0 and 5 mbGL. The pathway for effects on the hydrogeological receptors is shallow groundwater in the till or in shallow bedrock. The source of effects on the hydrogeological receptors is the construction, excavation and potential associated dewatering for the cuttings and watercourse crossings within this zone.
- **Zone 3** (Ch. 7+160 - 30+100): This zone is characterised by the poor aquifer, the Lough Mourne Formation, the Lough Eske Psammite Formation and the Barnesmore Granite. These formations are classified as Precambrian Quartzites, Gneisses & Schists and Granites and Other Igneous Intrusive rocks respectively and as low transmissivity rocks. Most of the groundwater flow will be in top 10 m of the aquifer and towards the east, as determined by topography. The bedrock aquifer is predominantly overlain by till and blanket peat of low permeability, by outcropping bedrock and by alluvial deposits along the river channels of moderate permeability and is likely to be in close hydraulic continuity with the surface water environment, where subsoils are thin or absent. The bedrock aquifer supports the Lough Eske and Ardnamona Wood and Croaghonagh Bog SACs, the Cashelnavean Bog, Meenagarranroe Bog, Lough Hill Bog and Barnesmore Bog NHAs through groundwater contributions and baseflow and is the likely source of water for

²⁴ [GSI, 2004. Donegal South GWB Description.](#)

groundwater abstractions in this zone, in the absence of a superficial deposit aquifer. Any excavations within this zone are likely to encounter groundwater in the till or in shallow bedrock at between 0 and 3 mbGL. The pathway for effects on the hydrogeological receptors is shallow groundwater in the till, alluvial deposits or in shallow bedrock. The source of effects on the hydrogeological receptors is the construction, excavation and potential associated dewatering for the two N15 underpasses, cuttings, bridge foundations and watercourse crossings within this zone.

10.4.4 Summary of Baseline Conditions

Table 10-10 lists the assigned receptor sensitivity/ importance for each of the identified water environment receptors described in the Receiving Environment section.

Table 10-10 - Receptor Sensitivity/ Importance

Receptor	Location relative to proposed development	Sensitivity/ Importance
WFD Groundwater Bodies		
Ballybofey	Underlies the proposed development from chainage 20490 onward	Very High - Contributes to Meenagarranroe Bog NHA
Castledearg	Underlies the proposed development from chainage 17220 to 20490	Very High - Contributes to Croaghonagh Bog SAC – Cashelnavean Bog and Lough Hill Bog NHAs
Donegal South	Underlies the proposed development from chainage 3950 to 17220	Very High - Contributes to Croaghonagh Bog and Lough Eske and Ardnamona Wood SACs - Barnesmore Bog and Cashelnavean Bog NHAs
Donegal-Ballintra	Underlies the proposed development from chainage 0 to 3950	Very High - Contributes to regionally important aquifer - Dinantian Pure Bedded Limestones – Lough Eske and Ardnamona Wood SAC
Doorin Point	Within study area – approximately 110m to the west of centreline	Very High - Contributes to Lough Eske and Ardnamona Wood SAC
Inver-Banagher Hill	Within study area – approximately 320m to the west of centreline	Very High - Contributes to Donegal Bay (Murvagh) and Lough Eske and Ardnamona Wood SACs - Donegal Bay SPA
Groundwater Abstractions		
2039SWW003	Crossing the proposed development between chainage 23350 and 24950	Low – Unknown use
2039SWW001	Crossing the proposed development from chainage 29650 onward	Low – Agricultural and domestic only
1737NEW001	Crossing the proposed development between chainage 3950 and 5000, and chainage 0 to 950 in Section 2 – Spur 1	Low – Unknown use
1737SEW117	30	Low – Other use
1737NEW007	30	Low – Other use
2037NWW011	90	Low – Other use
2037NWW012	95	Low – Other use
1737NEW011	110	Low – Other use

Receptor	Location relative to proposed development	Sensitivity/ Importance
1737NEW013	110	Low – Other use
1737SEW092	120	Low – Other use
2037NWW010	120	Low – Other use
1737SEW118	130	Low – Other use
1737NEW012	130	Low – Other use
2037NWW008	145	Low – Other use
2037NWW009	180	Low – Other use
1737SEW116	200	Low – Other use
2039SWW015	240	Low – Other use
1737SEW090	260	Low – Other use
1737SEW098	260	Low – Other use
1737SEW093	270	Low – Other use
1737SEW091	280	Low – Other use
1737SEW101	280	Low – Other use
1737SEW094	290	Low – Other use
1737NEW006	290	Low – Unknown use
Identified karst springs		
IE_GSI_Karst_40K_338	8 from CPO boundary	Medium
IE_GSI_Karst_40K_2457 (Spa Well)	Traversed by the proposed development where on embankment	Medium
Designated GWDTEs		
River Finn SAC	Crossing the proposed development between chainage 29260 and 29330	Very High - Designated SAC
Meenagarranroe Bog NHA	420m to the south	Very High - Designated NHA
Lough Hill Bog NHA	430m to the south	Very High - Designated NHA
Cashelnavean Bog NHA	Immediately adjacent to the west	Very High - Designated NHA
Croaghonagh Bog SAC and pNHA	Immediately adjacent to the east	Very High - Designated SAC
Barnesmore Bog NHA	Immediately adjacent to the east	Very High - Designated NHA
Lough Eske and Ardnamona Wood SAC	Crossing the proposed development from chainage 600 to 870 and 6550 to 6570 - 20 to 240 in Section 2 – Spur 1 – 870 to 960, 1030 to 1180, and 1800 to 1980 in Section 2 – Spur 2	Very High - Designated SAC
Donegal Bay SPA	370m to the south	Very High - Designated SPA
Donegal Bay (Murvagh) SAC and pNHA	370m to the south	Very High - Designated SAC
Non-designated GWDTEs		
Lougheask Demesne wet woodland	Crossing the proposed development from chainage 350 to 660 in Section 2 – Spur 1 – 100 to 700 in Section 2 – Spur 2	Very High - B Rating: Nationally Important

Receptor	Location relative to proposed development	Sensitivity/ Importance
Loughs Craig and Cullionboy	60m to the east	Medium - F Rating: unknown value – survey required ²⁵
Lough Amincheen lakes complex	390m to the northwest	Medium - F Rating: unknown value – survey required
Lough Nabreen	960m to the northwest	Medium - F Rating: unknown value – survey required
Lough Mourne and cutover	Crossing the proposed development between chainage	Medium - F Rating: unknown value – survey required
Corraine Meencrumlin complex	115m to the north	Medium - F Rating: unknown value – survey required
Wet heath habitats	Traversed or immediately adjacent to proposed development	High - County importance
Raised bog habitat	50m to northeast	High - Local importance (higher value)
Blanket bog habitat	Traversed or immediately adjacent to proposed development	High - County importance

10.5 Embedded Mitigation Measures

The TII 2025 Guidelines define embedded mitigation measures as generalised, ‘good practice’ measures, such as the use of scheme drainage design, construction and environmental management plan (CEMP), where necessary or the proposed operational drainage design of the project.

As these methods of mitigation are generally standardised across TII projects but also comprise good practice, they are considered embedded mitigation.

10.5.1 Pre-Construction Phase

10.5.1.1 Construction Environmental Management Plan

A Construction Environmental Management Plan (CEMP) has been prepared, see Appendix 4.1 in Volume 4 of this EIAR. The CEMP sets out the key environmental considerations to be adhered to by the contractor during the construction of the proposed development. The CEMP also details the environmental avoidance, mitigation and monitoring measures to be implemented to minimise potential environmental impacts and to comply with the environmental commitments outlined in the EIAR. It covers all potentially polluting activities and includes an Incident Response Plan (IRP) (See Appendix 4.1 of this EIAR). The CEMP will be reviewed and updated on a regular basis and modified and extended by any relevant construction related requirements imposed as conditions of any planning permission granted. The Contractor will be contractually obliged to comply with all such measures.

A Water Management Plan and Monitoring Plan will be prepared as part of the CEMP. The scope of the groundwater quality and level monitoring programme will be developed in consultation with relevant stakeholders. The plan will need to be informed by, or updated by, any conditions imposed by the EPA and DCC in respect of any environmental permits, licences or consents that will need to be obtained in the future, and will be informed by TII 2025 Guidelines, which contains guidance on monitoring timelines, parameters, limits, guidelines and standards.

The CEMP will detail pre-construction and construction groundwater level and quality monitoring to be undertaken. Water level monitoring will be required at selected GI monitoring boreholes, adjacent to sensitive water bodies, GWDTEs and abstractions, and adjacent to

²⁵ [MIW Intro — Wetland Surveys](#)

construction locations requiring dewatering. The scope of the monitoring will be agreed with the relevant authorities and DCC by the Contractor. Groundwater level and quality monitoring will continue throughout the construction period for as long as there are below ground activities ongoing that have the potential to result in a significant impact on the groundwater level or quality.

It is intended that the CEMP is updated by the Contractor prior to the commencement of the proposed development, to include any additional mitigation measures, conditions and or alterations to the EIAR and application documents that may emerge during the course of the planning process.

10.5.1.2 Environmental Operating Plan

In addition to the CEMP, an Environmental Operating Plan (EOP) has been developed, in accordance with the TII/ NRA's *Guidelines for the Creation and Maintenance of an Environmental Operating Plan*. The EOP sets out the Contractor's approach to managing environmental issues associated with the construction of the proposed development and provide a documented account to the implementation of the environmental commitments set out in the EIAR and measures stipulated in the planning conditions.

For example, an Environmental Clerk of Works (ECoW) will be employed for the duration of the construction works. The ECoW will be responsible for monitoring and ensuring the implement of all mitigation measures and compliance with legislative requirements in relation to the water environment.

An Outline EOP is an appendix to the CEMP, see Appendix 4.1 of this EIAR, and will be further developed by the Contractor.

10.5.2 Construction Phase

10.5.2.1 General Surface Water Management

General surface water management measures will have regard for CIRIA's *The SuDS Manual* (CIRIA, 2015), and TII's *Road Drainage and the Water Environment* (TII, 2015) and *Standards for Highways' DMRB LA 113, Road drainage and the water environment* (Standard for Highways, 2020) and have been detailed within the CEMP as summarised below:

- The existing surface water management system, such as drains, settlement ponds, outfalls and interceptors / separators, will be inspected and confirmed to be in suitable working order prior to any works commencing on the proposed development extent.
- New drainage installations will be installed in early stages of construction, alongside the remaining existing drainage facilities, which can be used to treat runoff for silt and hydrocarbons. Daily weather forecasting will also be used to inform the works schedule, ensuring excavation works do not coincide with high intensity or extreme rainfall events.
- The proposed surface water management system, including existing and proposed infrastructure, will be inspected and confirmed to be of sufficient capacity to treat any additional water generated by the works, including runoff from dust suppression, prior to discharge.
- Washout from power cleaning of drainage lines, oil interceptors or any other pipework which may contain pollutants will be collected and treated. No contaminated washout will be allowed enter any water body or be discharged to ground.
- There will be regular monitoring and prompt maintenance of the overall surface water management system throughout the works area. This will ensure that the drainage system continues to function as designed. The scope of the monitoring and maintenance will be developed at a post-consent stage and in consultation with relevant stakeholders.

- There will be no direct discharge to any water body at any time during the construction phases. All surface water runoff within the proposed development extent will be directed to this drainage system.

10.5.2.2 Sedimentation of Surface Waters

Silt mitigation measures will be designed to ensure that no sediment contamination, contaminated run off or untreated wastewater will enter watercourses. This is of particular concern the River Eske, Lowerymore River and surface water courses which fall under SACs and GWDTEs. The proposed works will be carried out by employing accepted good work practices during construction, and environment:

- All materials will be stored within temporary compounds (see construction compound and temporary construction area details in EIAR Volume 2 Chapter 4: Description of the Proposed Development) and transported to the works zone immediately prior to construction.
- Weather conditions will be taken into consideration when planning construction activities to minimise risk of run off from the Site.
- Provision of 50m exclusion zones and barriers (silt fences) between any excavated material and any surface water features to prevent sediment washing into the receiving water environment.
- If dewatering is required as part of the proposed works, e.g., in wet areas, water will be pumped via settlement tanks or collection basins where any solids can settle out, and suitable best practice dewatering methods will be used.
- The Contractor shall ensure that silt fences are regularly inspected and maintained during the construction phase.
- If very wet ground must be accessed during the construction process bog mats/aluminium panel tracks will be used to enable access to these areas by machinery. However, works will be scheduled to minimise access requirements during winter months.
- The Contractor shall ensure that all personnel working on site are trained in pollution incident control response. A regular review of weather forecasts of heavy rainfall is required, and the Contractor is required to prepare a contingency plan for before and after such events.
- The Contractor will carry out regular visual examinations of local watercourses that may be impacted by the proposed works during the construction phase to ensure that sediment is not above baseline conditions. In the unlikely event of water quality concerns, the Environmental Manager and ECoW will be consulted.
- Excavations will be left open for minimal periods to avoid acting as a conduit for surface water flows.
- Only emergency breakdown maintenance will be carried out on site. Emergency procedures and spillage kits will be available and construction staff will be familiar with emergency procedures.
- Appropriate containment facilities will be provided to ensure that any spills from vehicles are contained and removed off site. Adequate stocks of absorbent materials, such as sand, or commercially available spill kits shall be available.
- Entry by plant equipment, machinery, vehicles and construction personnel into watercourses or wet drainage ditches shall not be permitted. All routes used for construction traffic shall be protected against migration of soil or wastewater into watercourses.
- Cabins, containers, workshops, plant, materials storage and storage tanks shall not be located near any surface water channels and will be always located beyond the 50m hydrological buffer; and
- Unnecessary clearing and grading will be avoided.

10.5.2.3 Fuel and Chemical Handling

Fuel and chemical handling will be carried out by employing accepted good work practices during construction, and environmental management measures such as those discussed below:

- Unnecessary clearing and grading will be avoided.
- Oils and lubricants will be required to be stored at least 50m away from a watercourse where practical and stored in vessels designed to hold 110% of the capacity of the largest tank / container within the bunded area. All plant and equipment shall be checked for leaks of fuel and lubricants before being allowed onto the Site. The Contractor will allow for regular checks and maintenance as required.
- Drainage from the bunded area will be diverted for collection and safe disposal. All containers within the storage area will be clearly labelled so that appropriate remedial action can be taken in the event of a spillage. When moving drums from the bunded storage area to locations within the Site, a suitably sized spill pallet will be used for containing any spillages during transit.
- Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in designated impermeable refuelling areas isolated from surface water drains. Spill kit facilities will be provided at the fuelling area to provide for any accidental releases or spillages in and around the area. Any used spill kit materials should be disposed of via a Hazardous Waste Contractor.
- All equipment and machinery will be checked for leaks and other potential sources of contaminants before arriving on-site and daily. Any equipment or machinery likely to introduce to contaminants will not be brought on-site or will be removed from the Site immediately if any leak is discovered. Spill kits will be available to machine operators, and they will be trained in their use.
- The storage of hazardous substances will be necessary during construction, and several considerations will need to be made to reduce the potential for pollution from these sources. Fuel will be required to be stored at least 50m from a water body and refuelling will only take place in designated areas, on hardstanding by appropriately trained personnel.
- Adequate stocks of hydrocarbon absorbent materials (e.g., spill-kits and/or booms) will be held on-site to facilitate response to accidental spills. Spill response materials will also be stored on all construction vehicles.

10.5.2.4 Accident Spillage, Flooding or Other Emergencies

Accidental spillages, flooding, or other emergencies will be avoided by employing accepted good work practices during construction, and environmental management measures such as those discussed below:

- Leaking or empty oil drums will be removed from site immediately and disposed of via an appropriately licensed Waste Disposal Contractor.
- Spill kits and oil absorbent material will be carried by mobile plant and located at vulnerable locations (e.g., near oil filled equipment). Booms will be held on-site for works near water body/ drains. Spill kits will contain a breakable tie to show use and indicates whether it needs to be replenished. The Site Manager and Site Environmental Manager will be responsible for replenishing spill kits.
- An IRP will be prepared by the Contractor and included in the CEMP and construction workers trained to respond to spillages.
- A copy of the IRP will be kept in the Site Emergency Information File (along with other safety emergency preparedness plans) together with the results of any test of the plan.
- Oil interceptors will be required for refuelling areas; runoff from washing areas that contains detergents which may prevent oil interceptors from working correctly will be

prevented from entering oil separators by providing separate designated areas for washing and refuelling.

- Discharge with oils and chemicals from vehicle washing areas will be considered as trade effluent and therefore will be disposed off-site.
- The installation of protective bunds along all water body boundaries and drains during construction will filter contaminants and prevent adverse runoff.
- Any plant, machinery or vehicles will be regularly inspected and maintained to ensure they are in good working order and clean for use.
- Any site welfare facilities will be appropriately managed, and all foul waste disposed of by a licenced contractor to a suitably permitted facility.
- During the construction phase, the Contractor will monitor weather forecasts on a monthly, weekly, and daily basis, and plan works accordingly. The Contractor will describe in the Emergency Response Plan the actions it will take in the event of a possible flood event. These actions will be hierarchal meaning that as the risk increases the Contractor will implement more stringent protection measures. This is important to ensure all workers, the construction site and third-party land, property and people are adequately protected from flooding during the construction phase.

10.5.2.5 Control of Concrete and Lime

The construction methodology for substructures involves the pouring and curing of concrete. Therefore, the following embedded mitigation measures will be designed to ensure that no concrete and lime sediment contamination, contaminated runoff or untreated wastewater will enter watercourses:

- All ready-mixed concrete will be brought to the construction site by truck. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated water to the underlying subsoil and groundwater.
- Wash-down or wash-out of ready-mix concrete is prohibited within a minimum of 20m of any body of water, including ditches and ponds, or surface water drains, and within 5m of a foul drain. Washouts will only be allowed to take place in designated areas with an impervious surface.
- Concrete will be used to construct the proposed development and will therefore need to be managed to reduce the potential for pollution. The Contractor will be required to manage and mitigate concrete works ensuring that no concrete is laid during wet weather, so no concrete will be washed off the site and into the surface water drains or water bodies.
- Other mitigation measures include the use of barriers, avoiding the use of lean mix concrete near surface water features, keeping records of quantities of concrete used and monitoring pH levels in surface water features.

10.5.2.6 Management of Groundwater Related Activities

There may be localised control of groundwater required to enable the construction of the proposed development, particularly for culverts, bridge foundations, underpass construction and cuttings. Shallow groundwater which requires control and the installation of dewatering pumps may be encountered across the area. Observations from the preliminary GI include the presence of groundwater at depths 0.3 to 5 m BGL in some boreholes and trial pits, although no significant groundwater was found in peat-rich areas.

To minimise the impact of any groundwater control activities during construction on the water receptors, a Construction Groundwater Control Strategy will be prepared by the Contractor at the detailed design stage, in consideration of CIRIA's *Groundwater Control: Design and Practice, Second Edition* (CIRIA, 2016). Furthermore, best practice mitigation measures will be followed to avoid and or minimise impact on groundwater and will be included in the final CEMP. The mitigation measures will be informed by the findings from the planned GI which

will provide information of site-specific ground conditions, including groundwater levels, quality and hydraulic properties.

The strategy will outline such best practice mitigation measures as, but not limited, to the following:

- A sump hole will be created, and pumps will be installed and used to remove the groundwater from the excavation. The groundwater will be pumped to an outfall area with silt mitigation measures, as advised by the relevant consenting requirements.
- A physical cut-off barrier (such as a temporary cut-off wall or sheet piles) will be installed between the sump hole and any nearby water receptors requiring protection, or the use of artificial recharge of groundwater or surface water or to pipe a portion of the discharge water directly to the water receptor, ensuring the chemistry and sediment content of the discharge water is monitored and will not have an adverse reaction on the receptor.
- If discharging water to a nearby watercourse, the rate of discharge will need to be agreed with the EPA and DCC to ensure that there is no unacceptable increase in flood risk or risk of scour. Any discharge will need to be undertaken with the agreement of the relevant statutory regulator and will need to comply with the pollution prevention requirements set out in the CEMP.
- An outfall area will be created using silt bags on the hoses with a silt fence or a combination of two silt mitigation measures. The outfall area will be set up away from any watercourse crossings so the pumped water can naturally disperse into the surrounding area.
- Once the outfall has been set up, the EnvCoW will inspect the work prior to pumping. During this process, the outfall area will be monitored, and water quality of the discharge will also be regularly monitored.
- Managing the risk from groundwater flooding through appropriate working practices (during excavations) and with adequate plans and equipment in place for dewatering to ensure safe dry working environments.

Embedded mitigation measures to protect the soils, peat and bedrock geology during construction, are outlined in EIAR Volume 2 Chapter 08: Land and Soils.

10.5.3 Operation Phase

10.5.3.1 SuDS Design and Maintenance

It is important that during the proposed development operation phase that there is a requirement for regular inspection and maintenance of the SuDS elements drainage systems and the culverts. This will be carried out in accordance with best practice guidance including but not limited to CIRIA's *The SuDS Manual* (C753) and TII's *Grassed Surface Water Channels for Road Runoff* (DN-DNG-03073). Information regarding the maintenance regime will be provided in Operation and Maintenance manuals. The drainage system is designed in accordance with current guidance to ensure that the potential for siltation and blockages is minimised under normal operation. If there is any evidence of excessive erosion or sedimentation associated with new structures further actions will be considered to remedy that impact in as sustainable a way as possible.

The maintenance regime for proposed drainage assets, including any swales and filter drains, is set out in the Management and Maintenance Plan and will be implemented by DCC to reduce the residual risk from failure or improper function of the drainage system due to blockages.

10.5.3.2 Foul Water Management

The details of the foul water management for the operational phase of the proposed development will be agreed with the water services section of Uisce Éireann and DCC, prior to commencement.

10.5.3.3 Operational Monitoring

During operation, a post-construction water quality and groundwater level monitoring programme will be developed to ensure there is no long-lasting contamination to any water environment receptors. The scope and duration of the post-construction monitoring will also be confirmed with the relevant authorities and DCC by the Contractor and will be informed by the TII 2025 Guidelines.

10.5.3.4 Peat Mitigation

Where peat is identified in offline locations, a floating construction technique will be implemented. The floating pavement construction will involve the use of geogrid, geotextile and 6F2 capping on top of the sub-formation level, overlain by the pavement makeup. Floating pavement design is further detailed in EIAR Volume 2 Chapter 04: Description of Proposed Development, EIAR Volume 2 Chapter 07: Biodiversity, and EIAR Volume 2 Chapter 08: Land and Soils.

Scheme drainage elements associated with the proposed development, such as filter drains to keep the greenway surface free from surface water, will be developed to ensure there is no significant impact to peat, where immediately adjacent to the proposed development, such as the Croaghonagh Bog SAC and pNHA between chainages 17250 and 18200 approximately.

In accordance with DN-GEO-03047 and DN-GEO-03022, filter drains will be installed along the greenway at this location to maintain a surface free from runoff, outfalling to watercourses west of Lough Mourne.

To avoid impacts to the Croaghonagh Bog SAC and pNHA and avoid inducing a hydraulic gradient toward the bog, the filter drains between Chainage 17250 and 18200 will be positioned on the far side of the greenway surface to the bog, be no deeper than 1.5m and be wrapped in an impermeable membrane. This is to allow for surface water runoff only and not subsurface drainage or seepage from the bog.

10.6 Description of Potential Impacts

10.6.1 Do-Nothing Scenario

In the absence of the proposed development, no significant changes to hydrogeological receptors are likely to occur under the current regime. The nature or value of the study area, in terms of WFD status, water resources and designated water dependent sites, would continue unchanged.

10.6.2 Construction Impacts

The proposed development could result in potential impacts to the groundwater environment during construction, in terms of changes to water quality, water levels and flows (both surface and groundwater), and contributions to groundwater dependent ecosystems and groundwater abstractions. The following potential impacts have been considered as part of this assessment:

- Impacts on groundwater quality, due to the migration of sediments, or other construction chemicals/ wastewater, through **uncontrolled site runoff**.
- Impacts on groundwater quality, due to **accidental spillage** of oils, fuels, or other construction chemicals/ wastewater.
- Impacts on groundwater flows, levels, and contributions to abstractions and GWDTEs, due to altered drainage regimes for watercourse crossings, and discharging of abstracted water as a result of **dewatering for cuttings and excavations for structures**.

10.6.2.1 Impacts on Groundwater Quality due to Uncontrolled Site Runoff

Construction activities associated with the proposed development, such as earthworks, site preparation, stockpiling of soil material, levelling and grading operations, will disturb and expose soils, leaving them more vulnerable to erosion during rainfall events.

In places, these activities can also leave the ground more compacted, reducing infiltration to groundwater and increasing overland runoff to nearby watercourses, lakes and transitional water bodies, and to any connected surface water dependent ecosystems (SWDEs); while in others, these activities can increase the risk of contamination reaching groundwater and any connected watercourses, SWDEs, GWDTEs, springs or abstractions, where excavations expose the superficial deposits, or the underlying bedrock aquifers. Karst landforms, as well as large areas of sub cropping (less than 3mbGL) or outcropping bedrock, underlie the proposed development extent and are particularly vulnerable to contamination from these activities. The karst landforms are listed in Table 10-9.

Section 10.5 provides details of the embedded mitigation measures that are considered in this assessment. This includes scheme drainage design, CEMP and generalised 'good practice' measures, as detailed in EIAR Volume 2 Chapter 4: Description of the Proposed Development.

Uncontrolled runoff, containing excessive sediment or construction chemicals/ wastewater, could leave the construction areas and enter sensitive groundwater bodies (or connected surface waterbodies), thereby potentially reducing the water quality in the receiving water bodies. Given that much of the proposed development is low-lying within a glacial valley, uncontrolled runoff is more likely to enter surface water bodies, than the underlying low permeability aquifers. However, where there are significant areas of shallow or outcropping bedrock and karst landforms are present, the vulnerability of the aquifer to contamination increases.

With the embedded mitigation fully implemented, for groundwater receptors, where traversed by or located within 100 m of the proposed development extent (including land take, trailheads and construction compound areas), a *Temporary Negligible* impact is predicted on the WFD groundwater bodies, groundwater abstractions, GWDTEs (designated or non-designated) and karst landforms (including springs). For groundwater receptors, where located beyond 100 m of the proposed development extent, *No Impact* is predicted. The significance of impact for each identified hydrogeological receptor is outlined in Table 10-6.

10.6.2.2 Impacts on Groundwater Quality due to Accidental Spillages

During construction, fuel, hydraulic fluids, solvents, concrete, lime, grouts, paints and detergents and other potentially polluting substances will be stored and/ or used within the proposed development. While liquids such as oils, lubricants, paints, bituminous coatings, preservatives and weed killers present the greatest risk, fuel spillages from or the refuelling of machinery operating close to waterbodies or GWDTEs also present a risk. Like uncontrolled site runoff, the risk is greatest where works occur over areas of sub cropping or outcropping bedrock, close to karst landforms, and close to and within waterbodies.

Accidental spillages can result in a direct or indirect impact to groundwater and to connected watercourses, SWDEs, GWDTEs, springs or abstractions, depending on whether contaminants enter the entity directly, or migrate through the superficial deposits / bedrock in groundwater before entering a waterbody that is in hydraulic connection.

It has been assumed that all groundwater bodies traversed by the proposed development have the potential to be exposed and made vulnerable to direct impacts from accidental spillages. In addition, the identified karst landforms, principally the enclosed depression and swallow holes, are not considered as receptors in themselves, but rather as pathways for the rapid migration of pollutants into the underlying aquifer and WFD groundwater body.

Section 10.5 provides details of the 'embedded mitigation' measures that are considered in this assessment. This includes scheme drainage design and construction methodology, as detailed in EIAR Volume 2 Chapter 4: Description of the Proposed Development.

With the embedded mitigation fully implemented, for groundwater receptors, where traversed by or located within 100m of the proposed development extent (including land take, trailheads and construction compound areas), a *Temporary Negligible* impact is predicted on the WFD groundwater bodies, groundwater abstractions, GWDTEs (designated or non-designated) and karst landforms (including springs). For groundwater receptors, where located beyond 100m of the proposed development extent, *No Impact* is predicted. The significance of impact is given in Table 10-11.

10.6.2.3 Impacts to Groundwater Flows, Levels, and Contributions

Construction activities associated with the proposed development, such as structure foundations, culverts and dewatering to facilitate underpasses and cuttings, have the potential to alter natural groundwater levels, flows, and contributions to watercourses, SWDEs, GWDTEs, springs and abstractions.

Dewatering for cuttings, foundations and excavations

Underpass construction, as well as cuttings along the alignment will require excavation works to facilitate installation. These activities may require the control or dewatering of shallow groundwater in the superficial deposits and possibly bedrock to create a dry working environment. These activities have the potential to impact on groundwater levels, flows and contributions. The assessment takes account of the proposed cuttings, the findings of the preliminary GI and the identified hydrogeological receptors (see Appendix 10.1 in Volume 4 of this EIAR).

Culvert and structure foundation construction will require excavation works to facilitate installation. These activities will take place within or very close to watercourse channels and will most likely require the control of shallow groundwater in the adjacent superficial deposits to create a dry working environment. These activities have the potential to impact on groundwater levels, flows and contributions. The assessment takes account of the proposed structure foundation depths, the findings of the preliminary GI and the identified hydrogeological receptors (see Appendix 10.2 in Volume 4 of this EIAR).

The excavations for culverts are anticipated to reach maximum depths of 2 m below ground level, and any associated dewatering will therefore only take place in the superficial deposits. The excavations for structure foundations are anticipated to extend to meet bedrock, therefore any associated dewatering is likely to only take place in the superficial deposits.

The preliminary GI provides an indication of the likely depth of groundwater, by way of water strikes only – it should be noted that any observed water strikes are a snapshot of groundwater levels in time and in location, and in the absence of continued groundwater monitoring, it is unclear if water strikes are representative of the water table or indeed if the absence of observed water strikes is representative of the absence of significant groundwater.

However as much of the proposed development is low-lying within the glacial valley, and within close proximity to watercourses, lakes and wetlands (SWDEs and GWDTEs), the water table is likely to be shallow (less than 1mbGL). The WFD groundwater body descriptions for the study area also suggest that the water table could be as shallow as at or very close to the surface (Section 10.4.2.5). Therefore, cuttings or excavations for structure foundations of greater than 0.5 m in depth are considered likely to require localised dewatering of shallow groundwater in the superficial deposits, and, in locations, bedrock, by pumping.

With the embedded mitigation fully implemented, for groundwater receptors, where traversed by or located within 100m of the proposed development extent (including land take, trailheads and construction compound areas), a *Temporary Negligible* impact is predicted on the WFD groundwater bodies, groundwater abstractions, GWDTEs (designated or non-designated) and karst landforms (including springs). For groundwater receptors, where located beyond 100m of the proposed development extent, *No Impact* is predicted. The significance of impact for each identified hydrogeological receptor is outlined in Table 10-11.

The following key locations (and exceptions) are noted:

- Based on the findings of the ground investigations, the N56 underpass is to extend to below where bedrock was encountered (or where refusal was met). The N56

underpass is located within 140 m of the Lough Eske and Ardnamona Wood SAC along the channel of the Eske River and is to extend to 6.1 mbGL and into bedrock. Groundwater was encountered at 5 mbGL at EGBH01, indicating that localised dewatering of the bedrock aquifer is likely to be required here. With the embedded mitigation fully implemented, a *Temporary Negligible* impact is anticipated on the Lough Eske and Ardnamona Wood SAC, which could result in a **Not Significant** effect on the GWDTE qualifying interests of the SAC.

- Based on the findings of the ground investigations, the N15 underpass (Clar) is to extend to below where bedrock was encountered (or where refusal was met). The N15 underpass (Clar) is to extend to 4.2 mbGL and into bedrock. Groundwater was encountered at 2.2 mbGL at TP006, indicating that localised dewatering of the bedrock aquifer may be required here. The groundwater abstraction 1737SEW142 is located at 650 m of the N15 underpass (Clar); however, given that this abstraction is located upslope, it is unlikely to be impacted. *No Impact* is predicted.
- Based on the findings of the ground investigations, the N15 underpass will remain within the superficial deposits, where no groundwater was encountered. The N15 underpass is located within 35m of the Lough Eske and Ardnamona Wood SAC and within 145m of its qualifying interests of relevance to groundwater - the Annex I Priority Habitat, the Petrifying Spring. However, given that:
 - The superficial deposits consist of till derived from metamorphic rocks and blanket peat. This subsoil type, because of its low permeability, will not allow for water to permeate easily through the soil from the construction works to this Qualifying Interest.
 - The bedrock geology consists of Lough Eske Psammite Formation, which is characterised as a poor aquifer. This bedrock geology has low permeability, and there are no mapped faults connecting the spring and the area of the underpass.
 - The catchment or contributing area to the spring will be upslope to the north, where groundwater recharge is occurring on the higher ground, and in the opposite direction to the Lowerymore River and the proposed underpass.
 - Within such a low permeability setting, any dewatering required to construct the underpass will be minimal, and the impacts of which are very unlikely to propagate to the opposite bank of the river. Based on the weight-of-evidence, any dewatering required within the superficial deposits for the underpass construction is not predicted to impact the spring. *Having regard to the above, no impact* is predicted.
- The River Finn SAC is to be traversed by the proposed River Finn Bridge – a new bridge on existing piers. The SAC is mapped as containing three qualifying interests that are recognised GWDTEs – wet heath [4010], blanket bog [7130] and transition mires and quaking bogs [7140]. These are upland, terrestrial habitats and were not recorded during the ecological surveys undertaken for the proposed development. As these habitats are not mapped in NPWS (2017b), the locations of these habitats beyond the survey area were identified using current relevant Annex I datasets as per NPWS (2017c) and available satellite imagery. According to available data, these habitats occur at least 6km from the proposed development as the crow flies. For more detail, see EIAR Volume 2 Chapter 7: Biodiversity. There is no hydrogeological connection from the proposed development to these qualifying interests. *No Impact* is predicted.
- The Croaghonagh Bog SAC and pNHA is located immediately adjacent to the proposed development extent between chainage 17250 and 18200 approximately. The NPWS lists the qualifying interest for this site as blanket bog [7130], a recognised GWDTE; the Biodiversity Team mapped this area as upland blanket bog. Given that the proposed development is at grade here, impacts to groundwater levels, flows and contributions are unlikely. Any construction impacts to peat and any mitigation required are outlined in EIAR Volume 2 Chapter 8: Land and Soils. *No Impact* is

predicted. The potential impact of scheme drainage on this GWDTE is detailed in Section 10.6.3.

- The Barnesmore Bog NHA is located within the proposed development extent between chainages 13800 - 13950 and 14125 – 14350 approximately. The NPWS lists the qualifying interest for this site as peatlands, and the preliminary GI encountered shallow peat (1.3m) at nearby TP021. Given that the proposed development is at grade here, impacts to groundwater levels, flows and contributions are unlikely. Any construction impacts to peat and any mitigation required are outlined in EIAR Volume 2 Chapter 8: Land and Soils. *No Impact* is predicted.
- Between chainage 12150 and 12355, and chainage 10020 and 10100, wet heath habitats are traversed by the proposed development where in cutting. The cuttings respectively are to extend to 1.7 mbGL, into clay and the underlying bedrock and to 1.3 mbGL, into gravel. According to EPA (2008), wet heath habitats are the least sensitive of the listed GWDTEs with regards changes in groundwater level. With the embedded mitigation fully implemented, a *Temporary Low* impact is anticipated on these wet heath habitats, which could result in a **Slight** effect.
- The remainder of the designated and non-designated GWDTEs are located upslope and up hydraulic gradient from the proposed development extent; therefore, these sites are unlikely to be impacted by localised dewatering for cuttings and excavations. However, the Lough Eske and Ardnamona Wood SAC/ pNHA contains the proposed cutting at chainage 1930 – 2020, which will extend to a maximum depth of 2.4m into the superficial deposits. The superficial deposits here are mapped as metamorphic till and based on the preliminary GI findings, are described as clay. While groundwater is likely to be shallow close to the lake, these deposits are of low permeability and any localised dewatering required is likely to be minimal. With the embedded mitigation fully implemented, a *Temporary Negligible* impact is anticipated on the Lough Eske and Ardnamona Wood SAC, which could result in a **Not Significant** effect on the GWDTE qualifying interests of the SAC.
- The identified groundwater abstractions (other than the boreholes drilled for the purposes of greenway realignment) are either located on the opposite bank of the Lowerymore River, around the townland of Ardinawark, or upslope from the proposed development extent. Therefore, based on the weigh-of-evidence, any localised dewatering required is not predicted to impact these abstractions. The only exceptions to this are the following:
 - Groundwater abstraction 1737NEW001 (Drumnacarry) is mapped to an accuracy of 1 km close to the Eske Loop cuttings; therefore, it is not clear how close this feature is to the proposed cuttings, which will extend to a maximum depth of 3.4m and into bedrock, at least in places. The borehole use is recorded as “unknown” and to be of poor yield, and therefore is unlikely to be used for public, group or private supply. With the embedded mitigation fully implemented, a *Temporary Negligible* impact is anticipated, which could result in a **Not Significant** effect.
 - Groundwater abstraction 2039SWW015 (Blackburn Bridge) is mapped at approximately 250 m to chainage 23900, where at grade. The borehole use is recorded as “unknown” and to be of poor yield, and therefore is unlikely to be used for public, group or private supply. No cuttings or excavations are planned in this area. *Having regard to the above, no impact* is anticipated.

Construction activities on embankment:

Construction activities associated with the proposed development, such as earthworks, have the potential to alter natural groundwater flows, where groundwater is emerging at the surface at a spring.

The following key locations are noted:

- The 'Spa Well' (IE_GSI_Karst_40K_2457), a karst spring feature, is traversed by the proposed development at chainage 4250, where on embankment. The construction of the embankment here is likely to impact on the spring flows. There is no GSI record of the spring being used for supply purposes and there is no other information available to this study about the spring yield or flows. With the embedded mitigation fully implemented, a *Temporary Low* impact is anticipated, which could result in a **Slight** effect.
- The second identified karst spring (IE_GSI_Karst_40K_388) is located within 8m of the proposed development at chainage 4650, where at grade. The construction of the proposed development here is likely to impact on the spring flows. There is no GSI record of the spring being used for supply purposes and there is no other information available to this study about the spring yield or flows. With the embedded mitigation fully implemented, a *Temporary Low* impact is anticipated, which could result in a **Slight** effect.

10.6.2.4 Summary of Construction Impacts

Table 10-11 summarises the identified hydrogeological receptors, proximity/ hydraulic connection to the proposed development, source of potential impact, receptor sensitivity/ importance, magnitude of impact and rating of effect significance.

Table 10-11 - Summary of Construction Effects

Source of Potential Impact	Receptor Type	Receptor Name	Importance	Rationale	Magnitude of Impact	Significance of Effect
Uncontrolled site runoff, and accidental spillages and leaks	WFD groundwater bodies	Ballybofey	Very High	Underlies the proposed development	Negligible - Temporary	Not Significant
		Castlederg				
		Donegal South				
		Donegal-Ballintra				
		Doorin Point				
		Inver-Banagher Hill				
	Groundwater abstractions	1737NEW001	Low	Possibly within 100m of proposed development	Negligible - Temporary	Imperceptible
		All identified abstractions		Within study area		
	Karst springs	IE_GSI_Karst_40K_338	Medium	Within 8m of centreline	Negligible - Temporary	Not Significant
		IE_GSI_Karst_40K_2457 (Spa Well)		Traversed		
	Designated GWDTEs	River Finn SAC	Very High	Traversed	Negligible - Temporary	Not Significant
		Meenagarranroe Bog NHA		Within study area		
		Lough Hill Bog NHA		Immediately adjacent	Negligible - Temporary	Not Significant
		Cashelnavean Bog NHA				
		Croaghonagh Bog SAC and pNHA				
		Barnesmore Bog NHA		Traversed		
		Lough Eske and Ardnamona Wood SAC				
		Donegal Bay SPA		Within study area	No Impact	No Impact
		Donegal Bay (Murvagh) SAC and pNHA				
	Non-designated GWDTEs	Lougheask Demesne wet woodland	Very High	Traversed	Negligible - Temporary	Not Significant

Source of Potential Impact	Receptor Type	Receptor Name	Importance	Rationale	Magnitude of Impact	Significance of Effect
		Loughs Craig and Cullionboy	Medium	Within study area	No Impact	No Impact
		Lough Amincheen lakes complex				
		Lough Nabreen				
		Lough Mourne and cutover	High	Traversed	Negligible - Temporary	Imperceptible
		Corraine Meencrumlin complex		Within study area	No Impact	No Impact
		Wet heath habitats at chainages 10020 – 10100 and 12150 - 12355		Traversed and in cutting	Negligible - Temporary	Not Significant
		Remaining identified wet heath habitats		Within surveyed area	Negligible - Temporary	Not Significant
		Raised bog habitat at chainage 7625		Within surveyed area		
		Blanket bog habitat at chainage 5950		Traversed		
		Blanket bog habitat at chainage 12150 - 16150		Immediately adjacent to proposed development		
Alteration of groundwater levels and flows	WFD groundwater bodies	Ballybofey	Very High	Underlies the Proposed Development	Negligible - Temporary	Not Significant
		Castleberg				
		Donegal South				
		Donegal-Ballintra				
		Doorin Point				
	Groundwater Abstractions	Inver-Banagher Hill	Low	Within study area	No Impact	No Impact
		All identified abstractions		Within study area	Negligible – Temporary	Imperceptible
		1737NEW001		Possibly within 100m of proposed development	Negligible - Temporary	Imperceptible
	Karst landforms	IE_GSI_Karst_40K_338	Medium	Within 8m of centreline	Low - Temporary	Slight

Source of Potential Impact	Receptor Type	Receptor Name	Importance	Rationale	Magnitude of Impact	Significance of Effect
Designated GWDTEs		IE_GSI_Karst_40K_2457 (Spa Well)		Traversed	Low - Temporary	Slight
		River Finn SAC	Very High	Traversed but GWDTE qualifying interests at distance from proposed development	No Impact	No Impact
		Meenagarranroe Bog NHA	Very High	Within study area		
		Lough Hill Bog NHA				
		Cashelnavean Bog NHA		Immediately adjacent		
		Croaghonagh Bog SAC and pNHA	Extremely High			
		Barnesmore Bog NHA	Very High			
		Lough Eske and Ardnamona Wood SAC	Extremely High	Traversed	Negligible - Temporary	Not Significant
		Donegal Bay SPA		Within study area	No Impact	No Impact
		Donegal Bay (Murvagh) SAC and pNHA				
	Non-designated GWDTEs	Lougheask Demesne wet woodland	Very High	Traversed but no GWDTE qualifying interests	No Impact	No Impact
		Loughs Craig and Cullionboy	Medium	Within study area	No Impact	No Impact
		Lough Amincheen lakes complex				
		Lough Nabreen				
		Lough Mourne and cutover		Traversed	Negligible - Temporary	Imperceptible
		Corraine Meencrumlin complex		Within study area	No Impact	No Impact
		Wet heath habitats at chainages 10020 – 10100 and 12150 - 12355	High	Traversed and in cutting	Low - Temporary	Slight
		Remaining identified wet heath habitats		Within surveyed area	No Impact	No Impact

Source of Potential Impact	Receptor Type	Receptor Name	Importance	Rationale	Magnitude of Impact	Significance of Effect
		Raised bog habitat at chainage 7625		Within surveyed area	No Impact	No Impact
		Blanket bog habitat at chainage 5950		Traversed	Low - Temporary	Slight
		Blanket bog habitat at chainage 12150 - 16150		Immediately adjacent to proposed development	Negligible - Temporary	Not Significant

10.6.3 Operational Impacts

The proposed development could result in potential impacts to the water environment during operation, in terms of changes to groundwater quality, levels and flows, and contributions to watercourses, SWDEs, GWDTEs, springs and abstractions. The following potential impacts have been considered as part of this assessment:

- Impacts on groundwater water quality due to **accidental spillage** of oils, fuels, or other construction chemicals/ wastewater.

10.6.3.1 Impacts to Groundwater Quality due to Accidental Spillages

Like the construction phase, accidental spillages or leaks of fuel, detergents or other potentially polluting substances during the maintenance and operation of the proposed development have the potential to impact groundwater, and any connected watercourses, SWDEs, GWDTEs, springs and abstractions.

Section 10.35 provides details of the 'embedded mitigation' measures that are considered in this assessment. This includes scheme drainage design, CEMP and generalised 'good practice' measures as detailed in EIAR Volume 2 Chapter 4: Description of the Proposed Development.

Accidental spillages of construction chemicals, such as fuel, hydraulic fluids, solvents, concrete, lime, grouts, paints and detergents and other potentially polluting substances, could the construction areas and enter sensitive groundwater bodies (or connected surface waterbodies), thereby potentially reducing the water quality in the receiving water bodies. Given that much of the proposed development is low-lying within a glacial valley, uncontrolled runoff is more likely to enter surface water bodies, than the underlying low permeability aquifers. However, where there are significant areas of shallow or outcropping bedrock and karst landforms are present, the vulnerability of the aquifer to contamination increases.

With the embedded mitigation fully implemented, for groundwater receptors, where traversed by or located within 100m of the proposed development extent (including land take, trailheads and construction compound areas), a *Temporary Negligible* impact is predicted on the WFD groundwater bodies, groundwater abstractions, GWDTEs (designated or non-designated) and karst landforms (including springs). For groundwater receptors, where located beyond 100m of the proposed development extent, *No Impact* is predicted. The significance of impact for each identified hydrogeological receptor is outlined in Table 10-12.

10.6.3.2 Impacts to Groundwater Flows, Levels, and Contributions

Scheme drainage elements associated with the proposed development, such as filter drains to keep the greenway surface free from surface water, have the potential to alter natural groundwater levels and flows in adjacent GWDTEs.

The Croaghonagh Bog SAC and pNHA is located immediately adjacent to the proposed development extent between chainage 17250 and 18200 approximately. The NPWS lists the qualifying interest for this site as blanket bog [7130], a recognised GWDTE; the Biodiversity Team mapped this area as upland blanket bog. During a site visit undertaken by the design team in May 2026, the edge of the bog immediately adjacent to the proposed development and up to 40m from the edge inwards were observed to be friable and in a dry condition. A series of machine cut surface drains were observed within the up to 40m section, which appeared dry and not hydraulically active at the time of the visit. A series of gravel-lined open road drainage channels were observed at each of the four corners of the road bridge to drain the road of surface water. The historic railway line at this location was observed to contain silt and surface water. The source of surface water in this area is unclear; however, it seems more likely that the source is the road drainage channels rather than the bog, based on site observations. In accordance with DN-GEO-03047 and DN-GEO-03022, filter drains are proposed along the greenway at this location to maintain a surface free from runoff. These will outfall to watercourses west of Lough Mourne.

To avoid impacts on the Croaghonagh Bog SAC and pNHA, and to avoid establishing a hydraulic gradient towards the drains from the bog, the filter drains between chainages 17250

and 18200 will be positioned on the far side of the greenway surface to the bog, be no deeper than 1.5m and be wrapped in an impermeable membrane. This is to allow for surface water runoff only and not subsurface drainage or seepage from the bog.

With the embedded mitigation fully implemented, a *Permanent Negligible* impact is anticipated on the Croaghonagh Bog SAC and pNHA, which could result in a **Not Significant** effect. Any operational impacts to peat and any mitigation required are outlined EIAR Volume 2 Chapter 8: Land and Soils.

10.6.3.3 Summary of Operational Impacts

Table 10-12 summarises the identified hydrogeological receptors, proximity/ hydraulic connection to the proposed development, source of potential impact, receptor sensitivity/ importance, magnitude of impact and rating of effect significance.

Table 10-12 - Summary of Operational Effects

Source of Potential Impact	Receptor Type	Receptor Name	Importance	Rationale	Impact	Significance of Effect
Accidental spillages and leaks	WFD groundwater bodies	Ballybofey	Very High	Underlies the proposed development	Negligible - Temporary	Not Significant
		Castlederg				
		Donegal South				
		Donegal-Ballintra				
		Doorin Point				
		Inver-Banagher Hill		Within study area	No impact	No impact
	Groundwater abstractions	1737NEW001	Low	Possibly within 100m of proposed development	Negligible - Temporary	Imperceptible
		All identified abstractions		Within study area		
	Karst springs	IE_GSI_Karst_40K_338	Medium	Within 8m of centreline	Low - Temporary	Slight
		IE_GSI_Karst_40K_2457 (Spa Well)		Traversed		
	Designated GWDTEs	River Finn SAC	Very High	Traversed but GWDTE qualifying interests at distance from proposed development	– No Impact	No Impact
		Meenagarranroe Bog NHA		Within study area		
		Lough Hill Bog NHA		Immediately adjacent	Negligible - Temporary	Not Significant
		Cashelnavean Bog NHA				
		Croaghonagh Bog SAC and pNHA				
		Barnesmore Bog NHA		Traversed		
		Lough Eske and Ardnamona Wood SAC				
		Donegal Bay SPA		Within study area	No Impact	No Impact

Source of Potential Impact	Receptor Type	Receptor Name	Importance	Rationale	Impact	Significance of Effect
	Non-designated GWDTEs	Donegal Bay (Murvagh) SAC and pNHA				
		Lougheask Demesne wet woodland	Very High	Traversed but no GWDTE qualifying interests	No Impact	No Impact
		Loughs Craig and Cullionboy	Medium	Within study area	No Impact	No Impact
		Lough Amincheen lakes complex				
		Lough Nabreen				
		Lough Mourne and cutover				
		Corrairie Meencrumlin complex	High	Traversed	Negligible - Temporary	Imperceptible
		Wet heath habitats at chainages 10020 – 10100 and 12150 - 12355		Within study area	No Impact	No Impact
		Wet heath habitats at chainages 10020 – 10100 and 12150 - 12355		Traversed and in cutting	Low - Temporary	Slight
		Remaining identified wet heath habitats		Within surveyed area	No Impact	No Impact
		Raised bog habitat at chainage 7625		Within surveyed area	No Impact	No Impact
		Blanket bog habitat at chainage 5950		Traversed	Low - Temporary	Slight
		Blanket bog habitat at chainage 12150 - 16150		Immediately adjacent to proposed development	Negligible - Temporary	Not Significant
Alteration of groundwater levels and flows	Designated GWDTEs	Croaghonagh Bog SAC and pNHA	Extremely High	Immediately adjacent	Permanent - Low	Not Significant

10.7 Residual Impacts

10.7.1 Construction Phase

The implementation of 'embedded' measures outlined in Section 10.5 will significantly reduce the likelihood and magnitude of the potential impacts on the hydrogeological receptors occurring during the construction phase. The potential residual impacts of the proposed development on the groundwater environment, following the implementation of embedded and mitigation measures, are as predicted in Section 10.6.2 and outlined in Table 10-11.

10.8 References

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